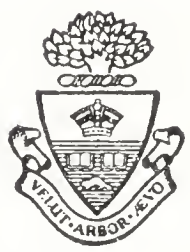

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Vol. XVI Toronto, November, 1938 No. 1

Editorial

"The season when ordinarily kindhearted business men fill up their pockets with cartridges
And go prowling around the woods in search of deer and partridges,"

has arrived, and with it Volume XVI. of the Journal.

Sixteen years ago a group of energetic undergraduates thought that the University of Toronto Medical School should have a Journal, and so they founded this publication. Sixteen years is not very long ago and yet the Journal they founded was the first undergraduate medical journal on this continent. That their ideals were sound has been shown by the numerous medical schools that have followed their example and also by the continued growth of the Journal.

In a school where the course leaps from rabbit to cadaver, from cadaver to museum, from museum to patient in well-defined jumps every Spring, there is bound to be a great division in interests. What was interesting in the pre-clinical years seems dull when viewed from the giddy heights of clinical apprenticeship. The Editorial staff is keenly aware of this and in trying to interest all, may fail to interest anyone—but bear with us and be lenient. There is no medical journal published in which every article is of interest to everyone of its subscribers.

From the monetary view-point you are getting good value for your money. Last year the actual cost of the Journal was 22 cents per issue but you only paid 17 cents. Of course a bargain is valuless unless it is useful. We hope you find the Journal of value.

So although the Queen, the Empire champagne and the crowds of Clydebank are not present, we formally launch Volume XVI of the University of Toronto Medical Journal.

* * *

WELCOME 4T4.

A placid frame of mind is not encouraged by the occasional reference to the overcrowding in the medical profession and the coincidental overcrowding in the Faculty of Medicine. We are keenly aware that such a condition exists and it forcefully reminds us of "Palmam qui meruit, ferat."

The first year is very different from what the first year of a medical course is imagined to be. It is difficult and sometimes disheartening but yet very essential. If nothing else, it should teach us to think scientifically.

Your fellow-undergraduates welcome you to the Faculty of Medicine and wish you every success in your initial year.

HYPOPARATHYROIDISM AND TETANY*

By R. F. FARQUHARSON, M.B., F.R.C.P. (C.)
Assistant Professor of Therapeutics

Clinical disorders of the parathyroid glands naturally fall into two groups: (1) those associated with glandular overfunction, of which the most striking manifestations are the skeletal changes; and (2) those associated with underfunction of the glands, with tetany as the outstanding symptom. In the present discussion the problems of hypoparathyroidism and tetany will be considered, mention being made of the opposite syndrome only for purposes of clarity and contrast.

The parathyroid glands are concerned with the regulation of the level of calcium and inorganic phosphorus in the blood and with the metabolism of these elements. Under normal conditions the serum calcium lies between 9 and 11† [1]milligrams per 100 cubic centimeters and the calcium stream of the body varies slightly in either direction, now depositing calcium in the bones when the intake is greater than the output and again taking previously stored calcium from the skeleton as the intake falls below excretory levels. Under a great variety of circumstances the bones act as a storehouse ready to receive or to give up calcium salts according to the demands of metabolism without any disturbance in their essential structure or function. Similarly, under normal circumstances, the levels of calcium and phosphorus in the serum vary within small limits and without appreciable effect on the function of any tissue.

When, however, there is gross disturbance in parathyroid activity certain striking changes occur. In hyperparathyroidism the serum calcium rises and serum phosphorus falls. Calcium taken in quantities from the bones is excreted in greatly increased amounts in the urine. Possibly, as a result of the high serum calcium, the patient suffers from general weakness and lassitude with muscular hypotonia.[2] The bones, slowly depleted of their calcium salts, begin to give under ordinary strain so that fractures and various types of deformity occur, almost always accompanied by loss of height due to shortening the spine, and frequently by bone tenderness and pain. Polyuria and polydipsia are early symptoms associated with the increased urinary excretion of calcium salts. From the same cause renal calculi may form and in some cases renal colic is the first symptom of importance.

Parathyroid insufficiency, on the other hand, results in a distinct lowering of the serum calcium with an associated rise in serum phosphorus, diminution in the urinary excretion of calcium and phosphorus and the clini-

*This paper (with minor alterations) was read before the Royal College of Physicians and Surgeons of Canada, October 29, 1934.

†In healthy individuals serum calcium levels lie between 9 and 11 mg. per 100 c.c., occasionally rising as high as 12 mg. Similarly, the serum inorganic phosphorus level lies usually between 3 and 4 mg., occasionally as high as 5 mg., and more rarely between 2 and 3 mg. In growing children the serum phosphorus level is higher, frequently being about 5 mg. After ingestion of carbohydrate or administration of insulin the inorganic phosphorus falls. Any finding of serum calcium below 8 mg. or above 12 mg. per 100 c.c. is abnormal and, similarly, phosphorus levels below 2.5 or above 5 mg. are abnormal. Considerable confusion has arisen with regard to the interpretation of blood calcium levels because of the inaccuracy of many reported results. Any method for determination of serum calcium demands the greatest care and accuracy on the part of the technician at all times. Solutions must be repeatedly checked and standardized. In the methods commonly used in which the precipitated calcium oxalate is titrated with dilute permanganate solutions, inaccuracy usually leads to a fallaciously high result.

cal picture of tetany, the symptoms being largely due to the decrease in calcium ion concentration in blood and tissues.

Tetany.

As its name implies, tetany is an affection characterized by tonic muscle spasms which involve especially the distal portion of the limbs, giving rise to the well-known picture of carpopedal spasm. The syndrome, however, is much more than simple muscle spasm for any part of the nervous system may be affected and paraesthesia from sensory disturbance is probably the most constant manifestation.

Tetany may occur in a number of different conditions, in all of which there appears to be some disturbance in calcium regulation. The common factor is hyperexcitability of nervous tissue which most probably is due to a reduction, absolute or relative, in the concentration of calcium ions. Usually the serum calcium level is abnormally low and is always so in chronic tetany. Hypocalcaemia is not an essential finding, however, for the syndrome may occur when the serum calcium is normal, particularly in conditions associated with alkalosis. Whether under such circumstances the calcium ion concentration is distinctly lowered or whether, as a result of the alkalosis or other factors, nervous tissue is rendered more excitable at ordinary concentration of calcium ions need not concern us here. In any case, the symptoms of tetany can always be relieved by the parenteral administration of soluble calcium salts and, for purposes of discussion, one may well consider that the syndrome is due to an insufficient concentration of calcium ions in the blood and tissues.

The Syndrome of Tetany.

Whatever the underlying cause may be, the syndrome of tetany is always essentially the same though varying greatly in severity at different times and in different individuals. Due to the increased excitability of motor nerves, spasm occurs spontaneously or on slight stimulation. Muscles of the forearm and hands and larynx are commonly involved and, less frequently, muscles of the legs and feet. Any muscle, however, may be affected and spasm of the muscles of the trunk, face, pharynx, diaphragm and eyes are not uncommonly noted. The spasms are usually symmetrical and the increased tonus varies greatly in degree from the extreme carpopedal and laryngeal spasms so characteristic of crisis of the disease to a slight stiffness of the arms and legs usually accompanied by hoarseness. Sympathetic motor nerves may also be involved, resulting in spasm of the cardia, pylorus, any sphincter or smooth muscle.

The sensory nerves are always affected. In fact, paraesthesia of the forearm and hand, often of ulnar distribution, is the most constant symptom of tetany, being present more or less continuously between attacks of carpal spasm. Usually it is felt as a tingling sensation which, when severe, is very distressing. Most commonly affecting the upper extremities, it may also be felt in the legs and feet, where it tends to have a sciatic distribution, and in the face, lips and tongue. Sometimes with severe tetany there are complaints of girdle sensations and of a feeling of great weight on the chest. In crisis there may be general numbness and peculiar sensations which the patient finds difficult to describe. Nor does the central nervous system escape. There may be cortical irritation with twitching. Drowsiness is not uncommon in severe attacks. Rarely general tonic convulsions and coma occur and in severe crisis may be fatal.

Even where there are no major manifestations of tetany between attacks, when paraesthesia may be present or absent, when the serum calcium level is but slightly reduced, the syndrome still manifests itself in general weakness and tiredness — a neurasthenic state that is possibly the result

of disturbance in the vegetative nervous system because of the reduced calcium ion concentration. These symptoms disappear when the serum calcium rises to normal and become much worse when spasms of tetany appear. Partly as a result of chronic ill-health in patients that only too often have a bad nervous background and due also to the change in calcium ion concentration, certain psychic manifestations are common. The patient often becomes nervous, self-centred, introspective, difficult to handle, sometimes hysterical, often emotional and depressed, and occasionally delirious, confused, or maniacal. Gross changes in conduct, slovenliness and carelessness of appearance may be noted. Such symptoms are exaggerated or may occur only in severe crises which are often preceded by a feeling of unrest and apprehension. They are relieved and tend to disappear when the serum calcium rises to normal and other symptoms and signs of tetany disappear.

In chronic tetany from any cause certain trophic changes are known to occur, such as the development of cataract and, less frequently, changes in nails, teeth and hair. These will be referred to later in greater detail.

Recognition of the Syndrome.

During an attack the syndrome is easily recognized, for the carpal spasm is highly characteristic. There is flexion of the metacarpophalangeal joints with extension of the fingers which are drawn together, the thumb and little finger being approximated in the hollowed palm. The wrists and elbows are slightly flexed and there is some pronation; the forearm is folded across the chest and the upper arm is held close to the side of the body. Similarly, in the less common pedal spasm the toes are flexed and adducted and the feet arched so that the sole is concave and the foot is extended at the ankle and inverted. In severe attacks when muscles of the trunk are involved, the anterior muscles are most affected: the head may be drawn forward and the pectoralis muscles tend to stand out. Involvement of the facial muscles gives rise to changes in appearance varying from a stiffness and puckering about the mouth to a peculiar grin when the angles of the mouth are drawn up and the eyes half closed.

In very severe attacks the patient may be helpless, in characteristic posture, almost unable to move, and breathing with difficulty. Rarely, coma with or without convulsions may supervene.

Associated with the characteristic spasm is intense tingling and numbness, chiefly involving the arms and legs. In severe attacks it becomes generalized and causes great discomfort or unrest. Even in the absence of the muscular contractions it may at times be quite severe and widespread. At such times, however, typical spasms are likely to occur from the slightest stimulation and, because of the sensory hyperexcitability, they are likely to be very painful.

The syndrome is usually so characteristic that one could hardly fail to recognize it; it is not likely to be confused with any other condition. Should convulsions occur in an acute attack, the characteristic posture between the generalized spasms will indicate that tetany is the underlying condition. The hysterical patient who knows a little about tetany is usually unaware of the constancy and nature of the paraesthesia and is seldom able to reproduce proper carpal spasm. If one is in doubt, as in mild cases when paraesthesia or general weakness is the chief complaint and spasm is absent or mild, there are some useful tests which help to clinch a strongly suggestive history.

(1) *Chvostek's sign*: This consists in a twitching of the upper lip or even the whole side of the face, elicited by a sharp tap over the facial nerve just in front of and below the ear. Almost always present in patients suffering from tetany, it is not an absolutely constant sign and may be demonstrated occasionally in healthy people.

(2) *Trousseau's sign* is more dependable although not quite so sensitive and occasionally absent when the condition is mild. It is a typical carpal spasm induced by pressure over the nerve trunks in the arm or by obstruction of the blood flow in the brachial artery. One may demonstrate it most easily by maintaining the pressure in a blood pressure cuff on the arm at or above the systolic level for a period of three minutes. Typical spasm appears in from a few seconds to one and one-half minutes and gradually increases, becoming so intense that one can with difficulty separate the patient's thumb from the palm. It is difficult to simulate this spasm for when it is attempted the thumb can usually be pulled away fairly easily and the voluntary contraction of the patient's muscles may readily be detected. The test is helpful in estimating the severity of the tetany and in judging the effect of treatment.

(3) *Erb's phenomenon*: One may obtain further evidence of tetany by demonstrating the increased excitability of motor nerves to electrical stimuli. The normal nerve should not be affected by cathodal opening stimulation with a current of 5 milliampères or less, whereas in tetany such currents induce contraction of the related muscles.

Classification of Tetany

As already stated, tetany may result from a number of causes, the most common of which may be grouped as follows:

(1) Parathyroid tetany:
  (a) spontaneous;
  (b) post-operative.

(2) Tetany occurring in certain disturbances of nutrition associated with:
  (a) rickets;
  (b) osteomalacia;
  (c) sprue and steatorrhoea.

(3) Tetany (usually transient) associated with rapid development of alkalosis:
  (a) gastric tetany, following upon repeated vomiting with dehydration, loss of hydrochloric acid and alkalosis;
  (b) hyperpnoea with tetany, following upon over-breathing and rapid blowing off of carbon dioxide. This may occur in hysterical patients, in nervous patients following mental shock or fright, or in acute upper respiratory diseases with irritable mucous membranes and reflexly stimulated forced expiration.

PARATHYROID TETANY

Parathyroid tetany may arise in the post-operative period following upon a subtotal (or total) thyroidectomy or, like myxoedema, it may occur spontaneously, being due perhaps to fibrous atrophy of the parathyroid glands.

Spontaneous parathyroid tetany is a rare disease. It affects both sexes at all ages but is decidedly more common in males. The onset is usually gradual with acraparaesthesia, weakness, lack of energy and fatigue and, later stiffness and awkwardness of limbs. Not infrequently its first appearance is associated with or follows an acute infection. Sooner or later attacks of characteristic spasm occur which may be very severe from the first. From this time the course is essentially the same as that of post-operative tetany.

Post-operative parathyroid tetany appears usually in from one to four days after a subtotal thryoidectomy, although occasionally the interval may be months or even years. It is an uncommon complication of the operation, which occurs almost entirely in females‡ and often after an operation for recurrent goitre. Typically, the patient

‡Since 1926 at the Toronto General Hospital the diagnosis of post-operative parathyroid tetany has been made in 24 patients, all women, in some cases the thyroidectomy having been performed elsewhere. From the Mayo Clinic, Boothby[3] reported 89 cases, 88 of which were females. Similarly, Jacques[4] found only 4 males in 34 cases.

begins to feel an unpleasant tingling and numbness in the limbs, especially in arms and hands, on the second or third day. Often no complaint is made of this paraesthesia which becomes more intense and more widespread on the third and fourth days when attacks of carpal spasm associated with hoarseness or stridor may appear. There is considerable variation in the time of appearance of these symptoms — sometimes spasms begin on the second day or they may not occur till the fifth day or much later. Always, however, tingling and numbness and usually stiffness precede the appearance of actual spasm. Before the onset of spasm, when the paraesthesia is the most outstanding symptom, although some stiffness of the arms may be present, the patient often has a sense of unrest and apprehension which increases to fear with the appearance of spasm.

The first crises are usually severe and may become dangerous because of laryngeal or diaphragmatic spasm. There is, however, great individual variation in the intensity and extent of involvement from the beginning. The attacks last from a few moments to an hour or more during which time, as well as between spasms, there is constant paraesthesia of the extremities and usually hoarseness.

After the initial sudden onset with severe tetany, the symptoms usually moderate and gradually—over a period of several weeks—the disease passes into the chronic stage. Sometimes, fortunately, the damage done to the parathyroid glands is of a temporary nature only and the symptoms disappear never to return. It is possible that mild transient tetany due to oedema and trauma of the parathyroid glands, and manifested only by paraesthesia with slight stiffness of the arms, occurs more commonly than is usually recognised. Some of the patients, however, in whom the initial symptoms seem to disappear completely, have recurrences in later years, particularly under such aggravating influences as pregnancy, malnutrition and infection. In the severe cases that go on to chronic tetany, it is probable that the greater part of the parathyroid tissue has been removed or destroyed. This may the more easily occur because the parathyroid glands sometimes have an anomalous position which renders them more likely to be seriously injured or excised.

In the state of chronic tetany, numbness and tingling of the forearms and hands is by far the most constant symptom. It is present almost every day for varying lengths of time, becomes worse with excitement and fatigue, and is almost constantly accompanied by nervousness and lack of energy as well as by a slight stiffness of the hands, which interferes with the fine movements of sewing, knitting, etc., and by hoarseness. Sometimes it is extermely severe, affecting the whole body. Superimposed on this chronic state are crises of carpal or more widely spread spasm of varying intensity. Whereas it is true that the crises tend to be less severe after the acute stage is past, it is none the less possible to have occasional crises of the greatest severity after months or years of chronic tetany.

There is great variation in severity in the symptoms of chronic post-operative tetany in different individuals depending in part on the amount of damage done to parathyroid tissue and on the individual reaction to the resulting hypocalcaemia but influenced also by the state of nutrition, the presence or absence of infection, the general physical condition, and the mental state. Some patients are totally incapacitated by almost continuous mild spasms with severe paraesthesia and hoarseness, becoming worse during recurring crises. In others, the symptoms are very mild and muscle spasm infrequent so that the patient may carry on with little inconvenience. At times latent periods during which there are no symptoms of tetany may last for weeks and months.

Factors that aggravate parathyroid

tetany. Acute attacks may be induced in patients with latent or mild tetany by a number of different factors that also aggravate any symptoms already present. The harmful influence of excitement and excessive fatigue has already been mentioned. Over-exertion, unhappiness, emotional disturbances and anxiety have similar effects. Acute infections of various kinds may be associated with definite crises. The condition is aggravated by anything that disturbs the general sense of well-being and especially by malnutrition. Diets rich in meat and other food containing relatively large amounts of phosphorus may be harmful.

Sometimes tetany will remain latent for weeks to appear in severe form during successive menstrual periods, and it has been common experience that patients with persistent tetany suffer more during menstruation then at other times. Similarly, pregnancy and lactation have an important influence. Indeed many authors classify tetany with pregnancy as a separate type of the syndrome. It is more probable, however, that pregnancy is a predisposing factor which in some way renders the patient more sensitive to the underlying cause of the disease. In 1895, Thomas[5] reported a characteristic case in which attacks of tetany recurred in the later months of each of six successive pregnancies, the patient reporting good health in the intervening periods. However, he found signs of mild tetany during the interval when she claimed to feel well. Similar aggravation of latent or mild tetany during pregnancy and lactation has been observed in parathyroidectomized animals.[5 6]

These various factors have similar effects on patients with other types of tetany. It is important to remember also that patients with parathyroid tetany may be subject to conditions that bring on the syndrome in other individuals. Indeed the nervous patient suffering from post-operative tetany is very prone to have periods of overbreathing and to vomit easily. In one hysterical patient who, becoming panicky with fear of tetany, takes hundreds of grains of calcium chloride in doses one after another, I have observed gastric tetany from repreated vomiting while the serum calcium was normal. The same patient frequently overbreathes under the influence of emotion and fear, thus greatly aggravating her parathyroid tetany.

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Editor's Note.—Part II of this paper will appear in a subsequent issue of the Journal.

THE REDISCOVERY OF OBSERVATION

By A. F. COVENTRY, B.A. (Oxon)
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One characteristic feature of the Revival of Learning in Europe was the rediscovery of observation. It was not the scientists who first responded to the stimulus of nature, but artisans and artists who realized the richness of the field that could be explored by observation.

By the fourteenth century of our era, scientific thought had become a system of interpreting the writings of ancient authorities of whom the most conspicuous were Aristotle, Pliny, Dioscorides and Galen; a number of writers who more or less closely followed them sometimes improved, perhaps as often debased the originals. Since texts could only be multiplied by manual copying it was only natural that abbreviations should be invented; in transcribing passages of doubtful meaning it was only reasonable to clarify the wording; and in the course of a thousand years numerous divergences had appeared, divergences that were accentuated as parts of this ancient learning passed into folk lore, highly tinged with magic, or were modified to teach some moral lesson as in the Physiologus, which was for a long time the chief reference book for natural history.

With this gradual evolution of the texts went an evolution of the illustrations, and scientifically speaking it was a retrograde development. Early drawings of plants for example, from which the later were descended, were in the main good; those of the famous Julia Anicia Disocrides of the fifth century are recognizable as to species. Now two factors operated to produce the scientifically valueless drawings of the later manuscripts, just before the introduction of printing. The first was a failure to recognize that plants of Northern Europe were not necessarily the same as those of the Mediterranean Region, about which the Graeco-Roman authors wrote, and hence that descriptions and illustrations of, say, Dioscorides were not applicable to Northern Europe without modification based on observation. The second factor that came into play was one that operates in a well-known game. The first man of a line of players makes a drawing and shows it to the man on his left; number two copies it and shows his drawing to number three; and so on to the last of the line: first and last drawings are then compared, usually with surprising results. A comparable process went on for hundreds of years in the scriptoria of Europe, and the effects were enhanced by the introduction of certain artistic conventions which developed during the process. The final result was exquisite manuscripts embellished with beautiful decorations bearing the names of plants to which they had not the faintest resemblance. The drawings had become as functionless as the buttons on the cuff of an ordinary coat, or the radiator cap on some modern cars.

During all this period of copying and annotating, of minute study of authorities, there had been on the part of scholars the minimum of observation; the traditions of the classical observers, whose works were the raw material of scientific studies of this period, had been forgotten by almost all, and the few who realized the scientific weakness of the situation were at least liable to suspicion, and possibly restraint. Adelard of Bath in the earlier part of the twelfth century disparages the influence of authority in investigating things accessible to human knowledge, "for what is authority but a halter?"

Early in the thirteenth century, the Emperor Frederick II, a man of ad-

vanced ideas on a wide range of subjects from diplomacy to hunting, wrote, or had written, *De arte venandi cum avibus,* the material of which he expressly says is largely the fruits of his own observation, since he has found that Aristotle "rarely or never hunted with birds, while we have all our life loved and followed this sport." Some historians regard the work of Frederick II as marking the beginning of the renaissance, and certainly as far as regards science he bends no knee to authority.

Albertus Magnus, about the same time, writing of animals in his great encyclopaedia, added a large number of personal observations which were new and often good, especially when they dealt with animals of Northern Europe, regions unknown to classical writers, but with which Albert was well acquainted. These observations did not, however, constitute an essential part of his system of thought, which was an attempt to bring Aristotle into agreement with current views.

Roger Bacon inveighed more explicitly than any man of this time against reliance on authority to decide matters open to observational and experimental investigation; for him the unproved assumption that a statement is correct because it is made by a famous man is a primary source of error in knowledge. There are other sources of error, such as a belief that the opinion of the uninformed must be right (a point that Adelard had also made), but as far as scientific work is concerned, willingness to accept another's statement without question is fatal to real progress in knowledge. The ultimate proof or disproof in questions of sensory fact lies in experiment, not argument.

It was not that these men lacked appreciation of the work of the ancients; far otherwise, for they were all at great pains to acquire an extensive knowledge of the learned writings of their forerunners, but for them this did not constitute a valid reason for supposing that all phenomena had been explored and recorded by the pioneers of the classical period.

It is perhaps hard to realize the difficulties under which these innovators laboured. Humanity desires certitudes, definitive pronouncements; the scholar who expresses the impossibility of reaching even an approximate finality seems to be running counter to one of man's deepest feelings. Authority is a comfortable thing, as even de Blainville, a famous zoologist of the first half of the last century, felt when he said of Albertus Magnus that he had so fully dealt with the main mass of zoological knowledge that nothing was left for the future but to fill in the details. It is no matter for surprise that these men stood alone in their time and that the world was slow to follow their lead.

With the arrival of the great renaissance of the fifteenth century, as distinct from the earlier renaissance represented by these men, observation of nature gradually seized the imagination not at first of the scientists, but of the artisans and artists; indeed, the artisans seem to have felt the appeal for some time before this. Some of the cathedrals that are among the greatest architectural ornaments of Europe were still in the process of building; the mason's work was in the hands of skilled artisans who were responsible not only for laying the stones but for the decorations that are so interesting a feature of the details. Among them is an immense variety of designs, many traditional in character, others based on natural objects. It seems likely that the man whose job for the day was the carving of a capital or corbel picked up on his way to work some object that caught his fancy, a spray of bramble, a flower, a frog, and used it as a motif. Modern examples of the same kind of treatment can be seen on the outside of the Croft Chapter House (there is an excellent salamander in a rather obscure corner) and among the decorations of Hart House.

The similar movement among the artists was more conspicuous and no doubt much more deliberately conscious. Their pictures begin to show, in place of traditional, stylized landscapes and plants, scenes taken first-hand from fresh observation, and plants drawn from life with such care and attention that in many cases the very species can now be named. The artists became naturalists, as is manifest, for example, in the work of Botticelli and Dürer; this new interest gives us the artist turned anatomist in Leonardo da Vinci, who also, among many other things, observed fossils appreciatively and with great care studied the flight of birds.

This awakening of interest in the outdoor world found a very marked expression in the sudden change that came over popular books of natural history, especially of plants, a change which was made easier by the arrival of printing in a practical form. Certainly some of the old functionless illustrations, with the traditionally associated descriptions, were among the earliest documents to be printed; but hard on them, indeed mingled with them, came a series of printed herbals, which in the course of a few years reached a standard of excellence in illustration that is not always attained even nowadays.

There was a clean, sharp break with the old traditions; the authors laid great stress on the fact that their pictures were made from living plants; that is, the return to observation was complete. These herbals are not scientific works, at least in any modern sense; they are perhaps the materials of science, but they made little if any attempt at comparison and none at classification, and thus did not approach the formulation of general laws such as are one of the aims of science. A number of them were written in native languages, instead of Latin, the language of scholarship. What these books did was to set a new pace, as it were, in description and observation; with improvement in one, the other inevitably becomes better, so that the effect is cumulative. The process was started unconsciously by artisans, enhanced by artists discovering new sources of beauty, applied by herbalists to the careful description of plants, and so prepared the ground for the scientific advances that rapidly followed.

At the time these herbals were reaching the public in abundance, just as the new movement in art was winning its way, Vesalius, the founder of modern anatomy, was beginning the training that led him in the end to make a clear claim for the right of observational science to be its own authority. Whether he was directly affected by the character of the new herbals is perhaps not certain, but he did grow up in an atmosphere in which more and more attention was being given to observation, and in which the world of nature was being rediscovered. With Vesalius this curious passage in the development of scientific thought may reasonably be considered to end. With him begins the modern period in which each branch of science began to realize its dependence on the other branches, and the idea of the unity of science became a working principle.

THE VITAMINS*

I. VITAMIN A.

By WALLACE GRAHAM, M.D., D.D.S., M.R.C.P.
(Department of Medicine)

History.

Only forty years ago an observation was made by Eijkman that fowls restricted to a diet of polished rice developed polyneuritis. This was a discovery of profound importance, as up to this time it was believed that the essential components of an adequate diet were proteins, carbohydrates, fats and several inorganic elements in suitable combination. For thirteen years Eijkman's observation attracted no attention from students of nutrition till Funk, in 1910, repeated the experiments and concluded that another factor was necessary in human nutrition, a lack of which resulted in polyneuritis. This substance he called "vitamine."

Hopkins, in 1912, experimented further by feeding purified fats, proteins, carbohydrates and salts to young animals and observed that they failed to grow, but that growth was resumed when small additions of milk were made to the diet. To these other necessary factors he gave the name "accessory substances." Later Osborne and Mendal and McCollum and Davis subdivided these unknown substances into two groups called by McCollum, "fat soluble A" and "water soluble B," both groups being necessary for life and growth. Further experiments have led to the isolation of many more vitamins each with a specific action, many of which have been isolated in pure form and some synthetically produced. We shall deal first with Vitamin A.

Chemistry and Physiology.

Vitamin A cannot be formed in the human body without the ingestion of plant pigments. This relationship between the carotenoid pigments and vitamin A was established by Moore[1] when he showed that the pigment carotene found in carrots was convertible in the body into vitamin A. The chemical structure of some thirty carotenoid pigments has now been established but, of these, only four are convertible *in vivo* into vitamin A, namely: *alpha*, *beta* and *gama* carotene and cryptoxanthene[2]. β carotene is much the most important of the four precursors, also known as provitamins, the others having a limited distribution in the natural food stuffs of man and animals. The term carotene, however, is often used to represent the whole group of provitamins. The liver is the probable site for the conversion of carotene into vitamin A, the equation being $C_{40}H_{56}$ (carotene) + $2H_2O \rightarrow 2C_{20}H_{30}O$ (vitamin A, empirical formula). That the liver cells are necessary for conversion of carotene to vitamin A is suggested by the fact that the transformation is diminished by phosphorus poisoning and in certain diseases of the liver.[3]

In most animals, storage of vitamin A occurs in the liver, the rat being able to store enough in a few days to supply its nutritional needs for several months.[4] Such reserves in the animal liver are utilized during periods of deficient diet and are important factors, for example in keeping the vitamin A potency of eggs and milk at a good level during the periods of winter feeding. A remarkable example of vitamin A storage, and an important one commercially, is found in fish livers, particularly in that of the halibut, which yields a liver oil with several hundred times the vitamin A potency of ordinary cod liver oils.

The function of vitamin A in cell

*Editor's Note: This is the first in a series of articles on the vitamins.

physiology[5] is well shown in the retina where deficiency in this vitamin leads to the condition of night blindness or hemeralopia. The cones of the retina are associated with perception of colour and visual functions which depend on light of high intensity. The rods are especially adapted to function in dim light[6] and contain visual purple which is said to transform the energy of dim light into a nervous impulse. Wald[7] has shown that visual purple is a conjugated protein in which vitamin A is a prosthetic group. The formation of visual purple is a continuous process and depends on a sufficient supply of vitamin A. In health, regeneration of visual purple occurs after the eyes have been a few minutes in the dark. In vitamin A deficiency the resynthesis of visual purple is abnormally slow and faulty vision results in the form of night blindness.

This decreased ability for dark adaptation is the earliest functional change in vitamin A deficiency so that an attempt has been made to measure it clinically by means of the biophotometer which measures the degree of impairment of light threshold and the rate and degree of dark adaptation. Jeans[8] reported in 1933 that 25 per cent. of rural children and 53 per cent. of city children showed poor visual adaptation which responded well to vitamin A therapy. Isaacs,[9] on the other hand, studied 143 healthy medical students, the purpose being to determine whether a correlation exists between vitamin A intake, biophotometer readings and clinical symptoms and, therefore, the value of the biophotometer for the clinical detection of vitamin A deficiency. She found no correlation between diet and the readings, and believes that as yet there is no mechanical method of detecting vitamin A deficiency.

Pathology.[5]

The pathognomonic pathological features of vitamin A deficiency are the consequence of epithelial changes. The first change is an epithelial atrophy followed by proliferation of basal cells which later form a stratified keratinizing layer. This replacement epithelium, regardless of the previous functions and structure of the region, is identical in all locations and comparable in all its layers with epidermis. The distribution of the keratinizing metaplasia may be widespread, involving the cornea, conjunctiva, bladder, ureter, renal pelvis, ducts of glands, the respiratory mucosa, uterus, etc.

Some features of the deficiency in man may be due to the accumulation of keratinized cells in glands and their ducts. Cysts of considerable size filled with yellowish cheesy masses of keratinized cells may be formed. Early workers erroneously regarded such cysts as abscesses, which led to the belief that vitamin A protected against infection. In infants suffering from severe deficiency, the earliest lesion is found in the trachea and bronchi. Occlusion of the bronchi by keratinized cells may result in the formation and filling of bronchiectatic cavities and atelectasis. Because of these changes in the respiratory mucosa pneumonia is the chief cause of death in infants suffering from vitamin A deficiency. Such pathological lesions, however, are seen rarely, if ever, in our hospitals.

The Eyes: Xerophthalmia and keratomalacia are seen only in cases of severe vitamin A deficiency. Epithelial changes involve the cornea and conjunctiva with atrophy and metaplasia in the ducts of the lacrymal glands. Necrosis of the cornea may occur, followed by infection and ulceration with severe impairment of vision and possibly permanent blindness. A tragic epidemic of xerophthalmia occurred in Denmark during the Great War[10] when high prices abroad resulted in excess exportation of dairy products and the consumption of cheaper fats at home, which were lacking in vitamin A.

The Teeth and Surrounding Tissues: A suggestion that the teeth and gums might be affected by vitamin A deficiency was made by M. Mellanby and

King[11] who placed puppies on diet deficient in vitamin A. The animals developed a marked hyperplasia of the gums which led to softening, gingivitis and pyorrhoea alveolaris. Degeneration of the cells which form enamel and dentine resulted in disorders of calcification with consequent dental deformity. Degeneration of the maxillary and mandibular divisions of the trigeminal nerve was observed in some of the animals. When vitamin A or carotene was added to the diet such lesions did not develop. Similar observations have not been made in humans so that the exact relation of vitamin A to dental disease in man is not yet established.

Skin: The skin in experimental animals is not specifically affected by vitamin A deficiency. In some adults the skin becomes dry and rough and a papular eruption may appear due to hyperkeratosis of the hair follicles. Atrophy of the sweat glands and keratinizing metaplasia of the ducts is responsible for the absence of sweat. In about 30 per cent. pustules develop. A general increase in the pigmentation of the skin and conjunctiva may occur, which is said to be due to melanin.[12]

Gastrointestinal tract: The mechanism of absorption of vitamin A and carotene probably involves linkage with fatty acids in the intestinal wall.[13] The presence of bile augments the absorption of carotene but there is some loss of both vitamin A and carotene in the stools. The loss in conditions such as steatorrhoea is naturally great and should signs of vitamin A deficiency appear, such cases would fail to improve on oral administration of the vitamin.

The Nervous System: The effect of vitamin A deficiency diets on the nervous system of various animals has been reported by many workers. E. Mellanby in 1931[14] reported inco-ordination, spasticity and paralysis in dogs on a diet rich in cereals and deficient in vitamin A. Degeneration of myelin sheaths, particularly in the sensory tracts of the cord, was demonstrated by Marchi staining. Later, in 1934,[15] degeneration of cells of the Gasserian ganglion and ophthalmic division of the fifth nerve was observed. In the Charles Mickle Lecture delivered in Toronto recently, Mellanby reported that further researches have shown an overgrowth of bone which, in the region of the foramina, might be responsible for the nerve destruction previously reported. Signs suggestive of nerve lesions in human beings have not been reported so that up to the present time we can recognize no specific effect of vitamin A deficiency on the nervous system of man.

Anti-Infective Properties of Vitamin A[13]

Vitamin A has been called by some the anti-infective vitamin, but this term should be discarded, as it gives an exaggerated impression of the value of vitamin A in infection.

Experimental evidence shows that vitamin A has an anti-infective value in cases of severe deficiency but it has no effect on the course of an infection unless the deficiency is present. It is felt that a moderate deficiency may increase the duration or severity of respiratory infections in man and an adequate diet therefore may be beneficial in such cases. There would seem, however, to be no adequate support for giving large doses of vitamin A in cases suffering from infection that already are having a normal vitamin A intake.

Methods of Assay.

As previously mentioned, there is as yet no satisfactory method for the quantitative determination of moderate vitamin A deficiency in humans, although the biophotometer has been used by many workers. Quantitative methods of analysis of vitamin A in food sources have been done by three methods.[16] In the biological method young rats are put on a depletion diet till their reserve store of vitamin A is gone, then each is fed on the test material for several weeks and the gain in weight and growth is used as a measure of the vita-

min A ingested. Colour tests are based on the fact that vitamin A, itself colourless, gives a blue colour with antimony trichloride in the presence of oxygen. Spectrographic or absorption methods are also used.

Food Sources.

In plants there seems to be a direct parallel between colour and vitamin A activity.[16] Green, yellow and orange are the colours indicating potential vitamin A activity. The outer green leaves of a head of lettuce or cabbage, for example, contain 30 to 40 times as much vitamin A as the inner white leaves; similarly, bleached celery contains little, if any, of the vitamin. Green peas, beans and asparagus are also good sources. A yellow colouration is also indicative of vitamin A activity, as in carrots and sweet potatoes, which are both excellent sources. The same applies to fruits, such as yellow peaches, apricots and bananas. But the colour test is not always infallible.

The colour relationship does not apply in the richer animal sources of the vitamin, such as mammalian and fish livers; however, the darker coloured egg yolks are usually richer in the vitamin. Dairy products are also included in the chief sources. Vegetable oils, with the exception of corn oil and red palm oil, contain little or none, and lard and beef fat are poor sources. Cereals, with the exception of yellow corn, are poor also.

As vitamin A is fairly stable to heat and very slightly soluble in water, it is less likely to be lost or inactivated during procedures of manufacture or preparation at home. It is not destroyed by boiling but oxidation destroys it and a considerable loss occurs if heated for long periods of time. Canned foods have practically the same vitamin A value as corresponding fresh foods. Freezing also retains the vitamin A potency. Foods that ordinarily can be stored in their natural state show no serious loss of vitamin A in nine to twelve months, but dried or dehydrated foods show a considerable loss.

Vitamin A Requirements.

No precise estimate of the vitamin A requirements or of the factors which affect these requirements in human beings exists to-day. Dark adaptation gives some measurement and the amount of vitamin A that will just prevent night blindness probably represents approximately the minimum requirement.[17] A margin of safety must be allowed for physiological variations and to enable the organism to store up reserves against such emergencies as illness with a low or restricted food intake. Still more liberal amounts must be allowed for growing children, wasting diseases, and pregnant and lactating women.

Dosage is standardized by the use of International Units of which one Unit is the growth promoting activity in rats of 0.0006 milligram of standard β carotene. A 50 per cent. margin of safety, providing 2,000 to 4,000 units of vitamin A daily for an adult, is advocated.[18] The Health Organization of the League of Nations recommends such an allowance as fully adequate on the basis of an intake of 500 cubic centimeters of whole milk, one egg, 25 grams of butter and a medium serving of green, leafy vegetables daily.

The vitamin A reserves of new-born infants have been reported to be very low but to rise rapidly in a well-fed infant during the first few months. Special attention should be given to the premature and artificially fed infant to ensure an adequate intake.

For children two to fourteen years of age, the Health Committee of the League of Nations recommends 6,000 to 8,000 units daily, which would be provided in one quart of milk, one egg, servings of green, leafy vegetables and butter, with one teaspoonful of cod liver oil daily. For pregnant and nursing mothers 5,000 units is suggested which, translated into food, is one quart of fresh, whole milk, one egg, one ounce of cheese, an average serv-

ing of green, leafy vegetables, and one teaspooonful of cod liver oil daily.

Hypervitaminosis A.

In human beings the ingestion of large amounts of vegetables, such as carrots or spinach, which contain much carotene, may lead to an accumulation of the pigment in the skin sufficient to cause a deep yellow colour. This pigmentation is particularly frequent in diabetes. Although this pigmentation is no doubt due to the presence of excess of the precursor carotene in the blood, the colour is no indication that the condition of hypervitaminosis exists and no harmful effects are caused by the hypercarotenaemia.

Injurious effects have been observed in certain animals after the administration of large amounts of concentrated preparations of vitamin A, but there is no adequate evidence that reasonable doses have any harmful effect on humans.

Finally, it should be stressed that pathological lesions due to vitamin A deficiency are very rarely seen in our hospitals in Toronto. The lesions referred to above are those of extreme deficiency which have occasionally been reported in time of famine, war, etc. There are some who claim that a widespread moderate deficiency in vitamin A exists, which presents no recognized clinical symptomatology but which should be treated by an increased intake of the vitamin. The presence of this so-called sub-clinical avitaminosis in humans, however, has not yet been satisfactorily established in regard to vitamin A.

The therapeutic use of vitamin A, therefore, would seem to be indicated only for those whose body stores have been exhausted or when the ingestion of the vitamin is inadequate. There is no evidence that feeding excess vitamin A—above the normal requirement—is of any value.

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FAMOUS MEDICAL SCHOOLS.*

THE HARVARD MEDICAL SCHOOL

By Laurence J. Stuppy, Harvard, 1939.

The Harvard Medical School, which was the fourth medical school to be founded in the United States, was begun as a branch of Harvard University in 1782. Modelled on the medical schools of the day, it consisted of a series of lectures on the University grounds in Cambridge, with a Faculty of three. Later, it moved to Boston for greater contact between the students and the sick. The intention was that the school would supplement and round out the information gained through the prevailing practice of apprenticeship. There was no well-outlined program of study, and examinations were not strict. In time, the policies of the school fell almost entirely into the hands of the Medical Faculty, where they became tightly and conservatively held. However, after 1850 there arose increasing pleas for higher standards and better methods of teaching.

These pleas were answered when Charles W. Eliot became president of the University in 1869. After a year of long discussion and heated argument, he convinced the profession that the school should be put on a sound University basis. More rigid examination and course requirements were made for the students, more capable teachers were employed, and the final examinations were drawn up to really test the students' fitness to practice medicine. This was the greatest reform in medical education the United States had seen.

In the years following growth was rapid, and the pre-clinical sciences began to take their place in the educational scheme. These demanded more and more space for laboratories. Where before a small two-story wooden building, adjacent to the Massachusetts General Hospital, had been sufficient for all the activities of a medical school, in 1883 the School moved to a building of five stories. Within a few years these quarters had become too small. In 1906 the School again moved, this time with greater fore-thought, and the present medical center was founded.

The present school buildings are made of marble and are five in number. With their surrounding grounds they occupy eleven acres. They house lecture halls, class-rooms, laboratories, a museum, and administrative offices. On adjoining ground or in the close vicinity are the Harvard School of Public Health, the Harvard Dental School, and nine independently run teaching hospitals. Farther removed are five other hospitals, closely affiliated with the school for teaching purposes. In these fourteen hospitals there are well-organized out-patient departments and over 4,000 beds available for clinical teaching.

In libraries the School is especially rich. The joint library of the Medical School and School of Public Health is located in the Administration Building and contains approximately 65,000 volumes, 185,000 pamphlets, and 548 current periodicals kept on file. The Boston Medical Library, 8 The Fenway, is open to those who desire to consult medical literature. It contains about 176,000 bound volumes, 150,000 pamphlets, and 926 current periodicals, many of which are catalogued at the School Library. The College Library is also open to the students of the Medical School. It contains about 4,000,000 volumes and pamphlets on a wide range of subjects. In addition to these, the student may

*Editor's Note: This is the first in a series of articles on famous medical schools by undergraduates of the respective schools.

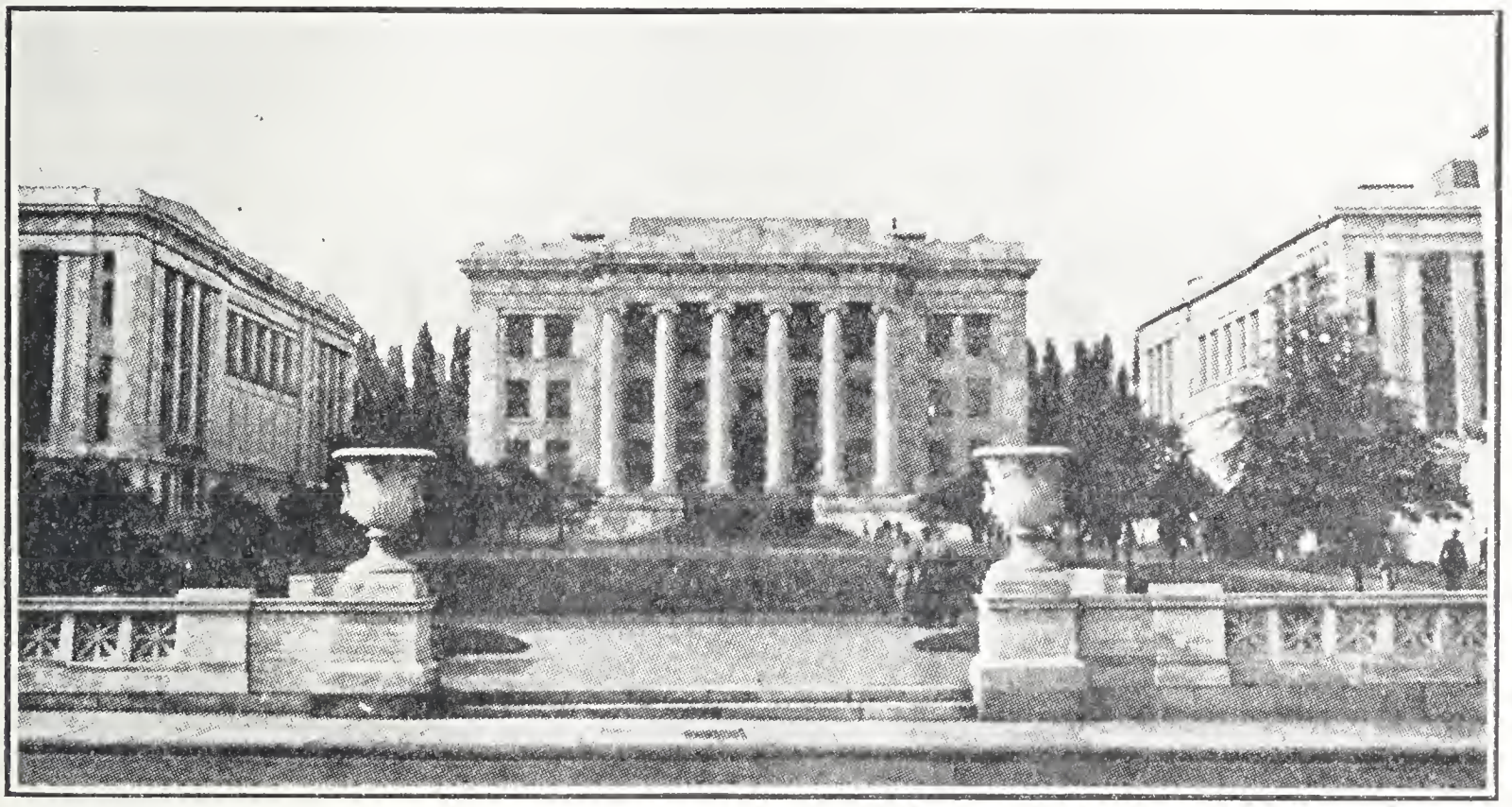
use the George Burgess Magrath Library of Legal Medicine, the Howe Library of Ophthamology, and the Boston Public Library of over 1,600,000 volumes.

The Warren Anatomical Museum occupies the upper three floors of the Administration Building and contains over 20,000 specimens, illustrating both normal and pathological anatomy. There is a fine collection of normal and diseased bones, and a section on neuropathology includes over fifty whole brain sections. Of historic interest is an exhibit of old surgical and anaesthetic instruments. A pathological collection of "hand" specimens, conveniently housed in forty gallon tanks is of great use to the students just before gross pathology examinations, and there are, also, mounted specimens to illustrate the major diseases.

Across the street from the School is Vanderbilt Hall, the student dormitory, opened in 1926. It is large enough to house all students wishing such facilities. There is a dining room, a gymnasium, and a common room named in honor of Charles Herbert Best. In the Hall are eight squash courts, and upon the school grounds are four tennis courts.

Clubs and societies use the Hall as their meeting place. Among these are Alpha Omega Alpha for highest scholarship, the Boylston Medical Society for the discussion of timely medical subjects, the Medical History Club, and the Medical Economics Club.

The student body here is widely drawn. In the present fourth year class (1939) there are representatives from 35 of the 48 states of the United States, and from several other countries. The number of students in the first and second year classes is limited to 125 each; the third and fourth year classes to 135, so as to allow transfer of students from other schools.



Harvard Medical School.

The Faculty, also, is cosmopolitan in origin and training, and is sufficiently large to allow for variations in viewpoint on the different medical problems. As early as 1883, the school filled the Parkman Professorship of Anatomy only "after careful inquiry had been made both in Europe and America for available candidates among anatomists of reputation." In the early years this policy was only easy to carry out in the scientific or laboratory branches of teaching, as the school controlled no hospitals, and a clinical teacher was only useful when he could supply hos-

pital facilities. However, in 1912 the Trustees of the Peter Bent Brigham Hospital recognized the vital need for a progressive hospital to have medical school affiliation, and entrusted the nomination of their chiefs of service to the Corporation of the University. Other hospitals soon adopted similar relations with the School. This enabled Harvard to look as widely in filling its clinical positions as it had formerly for its laboratory. In 1908, when Henry A. Christian was appointed Dean of the Medical Faculty, one who in his early training had no connection with Harvard University, the last suspicion of provincialism was gone.

The School has a professor of medicine and one of surgery in each of the four largest general teaching hospitals, and in addition, has representation in each specialty in more than one hospital, with hardly an exception.

Most of the students who enter receive their degrees after four years of work, but examinations are frequent, formidable at the end of each year, and comprehensive at the end of the fourth year. Courses during the first year and a half are largely confined to the school buildings. During the first year, anatomy, histology, physiology, and biochemistry are taken, two at a time. Pathology, bacteriology, and pharmacology, with their related subjects, carry through the entire second year, but during the second half stethoscopes appear, and physical diagnosis and surgery are added. The third year is less of a strain, with an hour of lecture for the whole class each morning at the School, and the remainder of the teaching in the hospitals, centering around the out-patient department.

During the fourth year, there are no formal classes, the student serving as a "clinical clerk" on the hospital wards, in real co-operation with the house staff. Five months are spent in the medical and surgical services, and one each in pediatrics, obstetrics, and one or more electives. The student takes a history and does a physical examination and laboratory work on each patient assigned to him, usually ten to fifteen per month. His written report is made a part of the hospital record after being checked by the interne. The remainder of his time is spent attending small classes, staff conferences, and the regular ward rounds, where he presents his case to the visiting physicians. A wide choice of services in the specialties is offered. Since fourth year courses are open during the whole of twelve months, there is time for vacation (up to four months) or study as one chooses. Students are given their choice of courses, hospitals, and months, in so far as there is not too great a duplication of choice. The fourth year is indeed a year of inspiration and valuable clinical experience, and the prospective doctor is given full opportunity to establish reading habits and develop his best qualities both in the science and art of medicine.

In addition, there is a tutorial system here whereby a certain proportion of the class who are in high standing are allowed to substitute special studies under the direction of a Faculty member for part of their fourth year work. Because of the way the fourth year is arranged, a student may take four to five months of tutorial, six to seven months of regular work, and still have a month of vacation. This system not only offers an opportunity for directed work to those who are definitely "research bent," but also gives a "taste of research" to others who are attracted but have never tried it.

Harvard Medical School offers research opportunities both to its own graduates and to those of other schools. Many of the fellowships and prizes offered do not stipulate from whence the recipient should have his medical degree, and two, the Francis Weld Peabody Memorial Fellowship of $3,000 and the Bullard Fellowships amounting to $1,175 yearly, are so worded as to be given to qualified members of the profession or graduates of qualified medical schools.

Courses for graduates have been

given formally since 1872, and cover all departments of the School. They vary from brief, intensive "brush-up" courses for busy practicing physicians to long courses for those who wish to specialize. The same laboratory and clinical facilities are opened to the graduates as are opened to undergraduates, and those qualified may arrange to undertake original research.

But not least of the concerns of the medical student here is internship. Boston offers about 80 internships, 40 of which are usually filled by Harvard men, and 40 of which are reserved for "new blood." Since the Boston appointments are not made until the first weeks of January, only those from this school who are in the first third of their class or who have a gambling spirit can afford to wait and apply for them. Others take positions to their liking elsewhere as they are offered earlier, and thus become widely scattered among American cities, for the most part nearer home again.

The University has always had the greatest influence upon the Medical School. For over three hundred years the University has attracted scholars primarily interested in the search for truth, and its motto "*Veritas*" and its traditional spirit, "the spirit of service," have pervaded the faculties of all its schools. Perhaps in no other city in the United States are the doctors less given to commercialism and more given to their art and teaching. Their spirit cannot but be an inspiration to students among them.

Of these loved teachers, a few should be mentioned who have been widely known. Not many realize that Oliver Wendell Holmes, more thought of as a literary figure, was one of our first professors of anatomy. Reginald Fitz was the first to recognize appendicitis as a clinical entity in 1886. Walter B. Cannon first demonstrated the value of the opaque meal and X-ray in the diagnosis of gastro-intestinal disorders, and has greatly furthered the knowledge of the sympathetic nervous system. George Minot and William Murphy discovered here the curative value of liver in pernicious anemia which has saved many lives. Theobald Smith once held the Chair of Comparative Pathology, and Harvey Cushing the Mosley Chair of Surgery. John Collins Warren, the second Hersey Professor of Anatomy and Surgery, was the operator at the first public demonstration of ether anaesthesia on the sixteenth of October, 1846.

A pioneer in the past and progressively building, it may be significant that in 1937 the School appointed an Assistant Professor of Medical Economics for one year to direct and assist those students who have become aware of the crying need for the better distribution of medical care. But whatever the future may demand, Harvard Medical School will continue to devote itself to the furthering of medical science and the producing of ever-better informed doctors.

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MICROSCOPIC EXAMINATION OF URINE

By VERA I. BINNINGTON '39

This phase of urinanalysis is one from which the internist and urologist of today derive some of their most precise information, but at one time in its history it was considered to be of doubtful value. Reasonably enough clinicians argued that if it were to be of use there should always be a direct relationship between the anatomical lesion present and the urinary morphology In a surprising number of cases such relationship seemed not to exist. For instance, a physician following a clinical case of nephritis perhaps found in the urine on one occasion red blood cells, and casts of all varieties and on the next examination few or none. Theories of "showers of casts" and so on grew up but when some observer became sufficiently piqued to look for the reason, it was found that the relationship postulated above did exist, but that the conditions under which the test was carried out were often calculated to destroy the very evidence which went to establish it.

This is a point which will still bear remembering. *Taken as an isolated factor, and carried out without the control which it demands, there are probably few tests which can, on occasion, give more misleading information.* Since urine is an aqueous solution whose specific gravity, reaction, and contents vary widely during the carrying out of its protective function of maintaining an optimal balance in the blood-stream, any extraneous material which finds its way into such a solution will undergo changes dependent upon the condition of the urine at the time of their entry into it, and on the length of time in which they remain suspended therein before observation. Red cells in urine of very high specific gravity will become crenated; as the concentration is lowered they balloon out, and lyse; sometimes ghostly outlines of the cells remain; but at other times they may disappear completely, so that although a chemical test for blood may have indicated its presence none may be found on examination, and a haemoglobinuria may be suspected where none actually exists. Again, the integrity of casts not only varies in the same way with the specific gravity of the urine, but also with its hydrogen-ion concentration so that the more alkaline the urine, the higher the concentration necessary to keep them in solution. Hence if the urine be alkaline on voiding, or as it undergoes ammoniacal decomposition on standing, the casts may dissolve and disappear. A nephritic patient, therefore, who drinks sufficient water, or whose concentrating power is very poor, will probably not show either red cells or casts in significant numbers, but will even prevent the formation of casts in the first place, since the rush of water down the tubules hinders the coagulation necessary to their formation. Consequently in order to obtain a true picture of the state of affairs a patient's fluid intake should be reduced to a recorded minimum for twelve hours or so prior to the collection of urine, which should be obtained early in the morning preferably, since such a specimen is usually the most concentrated sample of the twenty-four hour output.

Again, the picture may be clouded by factors arising from the structure of the urinary tract, and its proximity to that of the genital system. In both male and female the most distal portion of the urethra is always infected: diphtheroids, a virulent staphylococci, and the smegma bacillus being the chief invaders, and these may be a source of confusion when found on a slide, or they may have called forth a reaction which simulates an inflammatory renal condition. In children, more than one case of "pyelitis" (which seems to be the condition most likely to be wrongly diagnosed) has cleared up following a

dorsal slit on the prepuce, or the correction of other lesions in the genital tract.

But it is unnecessary to further point the moral: where accurate information is desired microscopic examination should be carried out on fresh, preferably centrifuged urine, which has been produced under known conditions of diet and fluid intake, and which has been collected by means of a catheter, with aseptic technique.

Gross Appearance.

If before beginning the microscopic work a mental note is made of the specific gravity, the reaction and the appearance of the gross specimen, many clues as to abnormal constituents and correct interpretations of the microscopic findings may be gained.

Normal urine is clear, sparkling, and straw-coloured, and on cooling a filmy mass of mucus, leucocytes, and epithelium settles out in the specimen. The colour changes found even in normal urine are due to variations in the amount of fluid ingested, its concentration, and amount lost by respiration, sweating or diarrhoea. The colour is due to the presence of pigments: urochrome, uroerythrin, and urorosein, chiefly to the first, which is derived from haemoglobin, yields pyrrol derivatives, and is quantitatively dependent on metabolic activity, hence its increase in fever and starvation. Uroerythrin is also thought to be derived from haemoglobin, but less is known of its chemistry. If present in excess, however, it may give colours ranging from pink to brick-dust, as is seen in the urate deposit typically found in diabetic coma.

A reddish-yellow or green colour indicates bile, and this indication is further substantiated if the urine foams when shaken. In hepatic disease, haemolytic anaemia, and following on improperly matched transfusions, urobilin appearing in the urine gives to it an orange colour, while shades ranging from pink to mahogany are found in the "smoky urine" of haematuria, a condition which always merits most careful consideration. Bright red urine may be due to frank bleeding, but it must also be remembered that occasionally it follows on the ingestion of beets, being due to the presence of anthrocyanin. Dull red to brownish-black urines with a similarly coloured deposit simulating old bleeding, are found in haemoglobinuria, a condition which suggests severe infections, burns, or poisons. If it is of a paroxysmal character, however, it will almost certainly be found to be due to syphilis, either congenital or acquired. Occasionally a haematoporphyrinuria will resemble either haematuria or haemoglobinuria, when large amounts of phenols or barbiturates have been administered.

Opalescent or shimmering urine suggests a bacteriuria of colon-typhoid origin, and if this appearance is accompanied by the characteristic odour of B. coli, there is little doubt as to what will be found.

Cloudiness is always found when much pus is present but may also be due to urates, phosphates or excess calcium. If due to phosphates, an iridescent film often forms on the surface, or the phosphate may sink as a chalky white deposit to the floor of the container. If it is due to pus, and the pus in sinking forms a dirty, greenish-yellow sediment of a slimy character, urinary retention is at once suggested, and this retention should be considered to be of renal origin, until proven otherwise.

Any obstruction to the thoracic duct will lead to rupture of lymphatics in the kidney or bladder, resulting in a milky urine, due to escaped chyle. If transient, it may on rare occasions be due to greatly increased ingestion of fat; this cause being ruled out it is probably due to a tumour mass, or to infestation by parasites, Filiaria bancrofti being the chief offender in tropical countries but rarely being found here. An increased cholesterol content in a nephritis, or a lipuria due to fracture or to diabetes may simulate such a chyluria, and there are in the

literature a very few recorded cases where the condition has apparently arisen spontaneously.

Urine, which when freshly voided contains much froth will usually be found to contain either sugar or albumin, or both. In male urine, white shreds or floaters are sometimes seen; they incate an inflammatory lesion in the urethra. If these shreds are transfered to a glass slide and stained, pus cells containing intracellular diplococci may often be demonstrated.

Microscopic Appearance

Turning now to the microscopic appearance of the sediment two classes of substance are encountered, namely *organic* and *inorganic*. The first group is made up chiefly of cells, casts, bacteria, mucus threads, and cylindroids; exceptionally other matter such as starch granules, yeast cells, parasites, spermatozoa, fat globules, or hair, may be encountered. In some cases of infection by B. welchii and related organisms gas has appeared in the urine, rarely it has also been found in entero-urinary fistulae and in diabetes. The inorganic substances are chiefly amorphous deposits, which cannot be identified, and crystals.

Crystals

Crystals were at one time very carefully evaluated, but are now considered to be of little assistance for diagnostic purposes. Urine being a solution of salts, the presence or absence of these substances in crystalline form will depend on the reaction, the temperature, pressure and concentration of that solution, and diet will also be largely responsible. If the urine has stood for some time they may be due simply to the breakdown of certain of its constituents as it undergoes ammoniacal decomposition, and the chief value of being able to recognize them lies in the fact that one will not then confuse them with other substances of greater importance.

Urates may, if present in great amounts, indicate a condition favourable to the formation of urinary calculi, but here the determination of blood uric acid would be of much greater significance. Phosphates, which are always found in alkaline urine appear in large quantities in primary neurasthenia, where the patient is apt to be disturbed by their presence, believing that the cloudy urine which they produce is due to some pathological condition. They are frequently noted in tuberculosis, and in other wasting diseases. Oxalates can usually be seen in any urine, their typical coffin-lid forms being readily recognizable. In some cases of general debility they tend to assume their dumb-bell form.

Of the rarer crystals cystine may sometimes be found, appearing as flat, transparent hexagonal crystals. It has no clinical significance, being due simply to an inborn error of metabolism whereby the amino acid cystine is not broken down into simpler compounds, but is excreted directly. Cholesterol crystals are also flat and colourless; oblong in shape they have a piece bitten out of one corner. Leucine, which occurs in spherical masses which show both radial and concentric striations and looks like small balls of wool, and tyrosine which crystallizes in sheaf formation, are perhaps the two crystals which really have diagnostic significance, but this is of scant comfort, since they are found in acute yellow atrophy of the liver, phosphorus poisoning, and other far advanced conditions characterized by rapid and excessive tissue breakdown where the diagnosis is extremely grave. Urine containing these crystals is very dark and shows a heavy deposit.

Cells

Three types of cells are met with in the organic fraction of the sediment: pus, epithelial cells, and red blood corpuscles.

Pus cells in excess are the commonest symptom of urinary infection. They impart a cloudy appearance to the

urine, and if it be alkaline, make it ropy in character. Occasionally their presence is of relatively good omen, in that they may elucidate the finding of a high albumin content, in which case the prognosis might be distinctly more favourable than if the albumin were found to be due to red blood cells, or to a serous exudate from a nephritic lesion. Most of these cells are polymorphonuclear leucocytes with the typical pawn-broker's nucleus, but eosinophiles and mononuclears are sometimes encountered.

Addis, using medical students as subjects, demonstrated by haemocytometer counts that from 600,000 to 1,000,000 cells were excreted in a twelve-hour specimen, together with a varying number of hyaline casts, and he advanced these figures as the normal. Another authority has pointed out, however, that unless the medical students in question were the exception rather than the rule, they would not be the most ideal controls for such an experiment, since as is well known an orthostatic or physiological albuminuria accompanied by a few red and white cells and casts, can readily enough be produced by long standing, mental strain and exercise, due to a faulty blood flow, and some degree of vasomotor instability. At any rate, it is generally agreed upon and accepted that whatever constitutes the true normal, the average individual does excrete a certain number of such cells. Campbell considers that from 3 to 5 pus cells per low power field in an uncatheterized specimen is within normal limits; Helmholtz gives 2 to 8 as his figure, and Friedman and Mitchell believe that more than 40 per mm. is always an indication of urinary infection. Some writers appear to pay little attention to the presence of pus unless it is clumped. This is a common finding in gonorrhoeal infections, but in other lesions the pus may represent from 15 to 20 per cent of the total volume of urine, without exhibiting this feature.

Whenever pyuria occurs, the inciting cause must be looked for and smears of the sediment, stained by Gram's stain, are useful in determining the organism present, but for this purpose only fresh urine, obtained under aseptic conditions is of value. If no organism can then be demonstrated a tuberculous focus must be suspected, and a stain suitable for demonstrating the tubercle bacillus used. Even if one does succeed in finding an acid-fast bacillus the task is not yet completed, as the ubiquitous smegma bacillus is also acid-fast, but since it does not hold the acid stain quite so tenaciously as the tubercle bacillus does, a smear which is stained simultaneously with one containing known tubercle bacillus, if such be available, may be differentiated in this way. Otherwise innoculation of suitable material in a guinea pig may be necessary. Because it is too often assumed that pus is sterile, cases of renal tuberculosis have been diagnosed as "Chronic pyelitis." Tuberculous urine in usually very acid in reaction, so much so that the growth of other organisms is inhibited, whereas, in an alkaline urine Staphylococcus, B. alkaligenes, and B. proteus flourish in abundance and even members of the colon-typhoid group may be found.

Neither the source nor the severity of a lesion is indicated by the finding of pus, which may have its origin anywhere along the whole urinary tract, or indeed may even be due to extra-renal lesions which have ruptured into the tract. Infection, toxins, trauma, chemical irritants, congenital lesions, foreign bodies acting as irritants, or even the severe dehydration of pyloric stenosis, and similar lesions, may be responsible for its production, and will determine whether or not it is infected or sterile. The local signs associated with the lesion may give a clue to its location and activity. In this regard, an abrupt cessation of pyuria should be looked upon with suspicion until the possibility of obstruction having supervened has been ruled out. When urine from cases showing pus is collected the first few c.c.'s should be discarded and the remainder collected in two glasses,

the last urine being kept separate, because in bed-ridden patients a large quantity of debris may sink to the floor of the bladder and being excreted last may hold the clue to the whole diagnosis.

With regard to epithelial cells, some writers confidently assert that they can identify the site of the lesion by the character of the epithelium found in the urine. While the different parts of the urinary tract do exhibit different types of epithelium and it seems logical to assume that a careful search would give valuable leads it is frequently difficult to assess one's findings in this regard because of distortion and because a certain number of these cells will normally be there. In nephritis, however, considerable importance is placed on the finding of cells suggestive of renal epithelium, particularly so if similar cells appear in cast form. Otherwise little importance can be attached to them, and they will always be found as contaminants in voided specimens.

Red blood cells when present are sometimes difficult to distinguish from crystals, pus cells, fat globules, or yeast cells if they happen to be present, and a drop of methylene blue stain allowed to run under the edge of the cover slip will stain the corpuscles faintly green so that they will stand out in sharp contrast to the blue staining pus and epithelial cells. The fact that they are roughly one half the size of the leucocytes and never granular will sometimes aid in their recognition. When they are found the question of their interpretation may be very difficult. Normally not more than 2 or 3 ever appear in a high power field, and anything over 5 is considered pathological, but the lesion responsible may be anywhere from the kidney to the urethra. A good working rule is to suspect in the following order: nephritis, a calculus; a neoplasm, or a tuberculous kidney. Drugs, emboli, faulty blood flow as in endocarditis, the diseases of the haemorrhagic diatheses, polycystic kidney, hypernephroma, syphilis of the renal vessels, polyps, simple cystitis or urethritis, may each contribute their quota towards the exhibition of these cells, so that the diagnosis is largely a matter of elimination. Once again the two bottle test will aid in locating the lesion if it is in the urinary tract; blood analysis may be utilized to rule out the blood dyscrasias, and if the heart is at fault the oliguria and associated signs are generally sufficiently obvious, but tests of renal function will make the interpretation clear.

Blood due to a nephritic lesion is always accompanied by casts, and if one repeatedly and easily finds these two signs in combination the diagnosis is probably mild glomerulo-nephritis even though the patient shows no other signs, and more particularly if there has been a recent history of streptococcal infection such as scarlet fever. Blood, either in large or small amounts is a remarkably constant finding in nephritis at any stage, and it continues until all other signs are gone, hence is of great importance as a criterion of the activity of the nephritic lesion.

Casts

Casts are cylindrical formations which originate in the tubules of the kidney as an expression of injury to cells lining these structures, their type depending on the nature of the process responsible for their formation. They are usually found in urine which contains albumin of renal origin, and since they may form even when only a small area of the kidney is involved they do not necessarily indicate the extent of the nephritis. Their presence, however, if constant is always indicative of kidney damage.

Hyaline casts are simply coagulated albumin. Serous exudate and degenerating cells may each contribute to their formation, leaving, as most of the substance is dissolved, only the shadowy outline of the original architecture. Such casts occasionally appear after exertion or stress, being in such cases a transient phenomenon, or they may occur in later sclerotic changes as in

the arterio-sclerotic kidney, in which they are a constant finding.

In more advanced irritations various other substances, e.g. epithelium, blood, and pus, may be cast off in the tubules and precipitated on such casts, though occasionally they appear to be bound together by some transparent matrix. Granular casts are made up of degenerating epithelial, fat, or red cells, and according to the nature and condition of these substances they will be finely or coarsely granular. The greater the integrity of the individual cells, and the more regular their arrangement the more rapidly they have been shed as in acute toxic conditions or chemical poisonings, where the entire tubular epithelium may be desquamated as a unit. Very broad coarsely granular casts appear in the terminal stages of nephritis and are designated "renal failure casts;" they indicate the extension of the lesion to the larger collecting tubules. Associated with them are high blood urea and creatinine values, so that they presage an imminent uraemia.

Casts in which pus cells predominate indicate pyelonephritis. Acute diffuse nephritis with renal haemorrhage and acute congestion results in the formation of blood casts, the erythrocytes being bound together by an hyaline or fibrinous matrix. In hypernephroma or polycystic kidney clot casts of the tubules may be found. Waxy casts are somewhat similar in appearance to hyaline ones, but differ from them in being of greater length and diameter, while possessing sharper outlines and a light yellow colour. These casts form in advanced stages of nephritis when amyloid change has supervened, and if they predominate in the specimen, point to a grave prognosis.

Miscellaneous Findings

Nucleoproteins of urine are often responsible for other formations termed cylindroids, which may be mistaken for casts, but which are found in normal as well as pathological urine, and which have no significance. These cylindroids are flatter than casts and often have forked or branching tails with wavy sides, whereas casts always possess parallel sides, and when whole specimens are seen, are two or three times as long as they are broad and have two rounded ends. Cylindroids may become coated with urates and simulate granular casts.

Shreds of mucus are sometimes mistaken for hyaline casts, but they are generally longer, thinner, and more irregular in outline. In chronic prostatitis short comma-like threads are found which under the microscope are seen to be composed of pus and epithelial cells stuck together by means of mucus. Following haematuria from any cause fibrin clots are sometimes met with. They consist of a light-coloured gelatinous material showing bundles of highly refractile parallel fibres. Other substances which require differentation from true sedimentary constituents are; fibres of cloth, hair, sputum, muscle fibres and even food particles.

Trichimonads

Of recent years clinicians in Canada have encountered in urine in a certain percentage of cases a small, active, parasitic flagellate, which in life is extremely changeable in shape; fusiform, pyriform, subspheroidal, or ovoid, it has four anterior free and equal flagellae, and a lateral, posteriorly directed flagellum incorporated in an undulating membrane. Donne discovered it in 1836 in Paris, finding it chiefly in purulent acid vaginal discharges often in connection with venereal disease, though there appears to be no particular reason for this. The organism is widespread throughout the southern United States, but has appeared in the northern states and in Canada within the last decade. Its action is unknown; it has been accused of causing a characterisitic vaginitis and of prolonging existing irritations. In cases of urinary infection where it exists it may

very readily be demonstrated in fresh undiluted material, preferably on a warm stage. It is extremely active in acid medium; in cold or stale urine the parasites may become rounded up and lose their flagellae, presenting then an appearance suggestive of infection by amoebae.

Summary

Microscopic examination of urine does not always give in itself a positive diagnosis; rather its findings are a finger pointing in the direction along which adequate investigation lies. Always these findings must be considered against the background of the history, the clinical picture and the other laboratory findings. For even when primary urinary tract disease is known to exist the entire body must be considered, for it is quite as important that some other condition which is aggravating this disease should be recognized as it is to find, conversely, that some unsuspected lesion in the urinary tract is the primary focus lighting up a condition which resists treatment. It is the picture as a whole which is suggestive, but as Addis and Oliver have pointed out, the suggestion comes only to the man who knows the patient.

The writer wishes to acknowledge the generous assistance accorded her in the preparation of this article by Mr. H. W. Wakefield.

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WHY HOSPITALIZATION FOR THE MENTALLY ILL?*

By A. G. SHULMAN, '39

It has been said on many occasions that the only thing done in a mental hospital is to serve the custodial function of sheltering and feeding the patients. Such a declaration is wholly unjustified and certainly should not exist, at least in the minds of informed medical men. It is therefore the purpose here to set out in brief form, several of the lines of treatment that are carried out at present in a modern mental hospital. Schizophrenia has been chosen for discussion since it usually involves about 60% of the hospital population, and also because shock therapy is at present used only in these cases; a brief description of the latter is included here.

Forms of Treatment:

1. Psychotherapy
2. Occupational therapy
3. Shock therapy
4. Hydrotherapy
5. Hospital care
6. Care of physical condition and active treatment of physical disorders.

In attempting to classify modes of treatment it is to be remembered that all of these overlap and any academic attempt to separate them is made at the expense of sacrificing some details of the true picture. Thus, for example, occupational therapy always is part and parcel of a planned psychotherapeutic approach. Again, shock therapy is always accompanied by some psychotherapy.

Psychotherapy

It should be stated here at the outset that cases treated in hospital are, in general, those in the late stages of the disease; that it is true of the laity and of physicians alike to mistake the peculiarities and misdemeanors of early schizophrenia for childishness, and only when punishment seems to be useless, is it thought of in the terms of illness. It is also unfortunate but true that psychiatrists are the last to be consulted, falling in line after the natural order of osteopaths, Christian Scientists, and others. Remembering then, that the cases treated are often in their later stages and so far more difficult to cure, we see the necessity for early recognition, the latter to be obtained by closer co-operation between psychiatrists and out-patient departments on the one hand, and child guidance clinics and schools on the other.

Generally speaking, in incipient schizophrenic illness a suitable analysis is possible, and in advanced cases with full fledged psychoses, symptomatic treatment must be carried out. Opportunities for socialization, occupation and re-education are utilized in treatment. Often one must be satisfied with a life adjustment on a lower level, and in many, permanent hospitalization is necessary; the latter refers not to mere custodial attention, but to creating new opportunities and new contacts which may in even apparently hopeless cases of years standing lead to remarkable improvement.

Several important principles are involved in psychotherapy. The first point is the establishment of a healthy rapport using the patient's interests as a guide. Socialization of the patient is important and thus isolation is avoided. Although treated therefore in groups, individual considerations of the particular patient are kept constantly before the psychiatrist. Important too is an analysis of the personality content and so he plans a definite attack on the problem. Thus the physician plays a planned active role and knows when

*Editor's Note.—To the majority of under graduates what happens behind the closed doors of mental hospitals is a mystery. This unfortunately is reflected in their attitude towards mental hospitals when they become practising physicians. As an attempt to correct that attitude this article was written.

to stop and change his tactics if necessary. By this analysis of personality content, the patient may in time see his faulty conclusions and the factors that caused his withdrawal reaction, and by careful treatment the patient may save many of his better personality features so that he may use them constructively for purposes of adjustment.

Symptomatic treatment is often necessary. Hallucinations and delusions are listened to with an open mind and are summed up finally by the psychiatrist by a statement that avoids offending yet suggests some doubt as to their validity.

Re-education is often required where habit deterioration has occurred. Encouragement, tact and firmness are utilised to cause any improvement in habits of behaviour, thinking and emotional control.

Well planned occupation is important. This is discussed at more length below under "Occupational Therapy."

Occupational and Recreational Therapy

The therapy must be planned to the patient's original interests and must have enough changes to prevent monotony. The goal is to teach the patient to get satisfaction from his task and so it is important that he finish his work to see the end result. Of the branches involved, almost every type of work and play are included — handicraft, physical labor, intellectual work, music, shows, games, etc.

From the point of view of the therapist, the objective is first of all to secure the patient's interest, and then his co-operation, to show him there are things he can do, and do well, to prove to him that he is not useless and defeated and that he can make a success of life once again.

A proper admixture of occupation and recreation is the best influence we have for preserving mental health or restoring it in the mentally ill. The patient must get interesting work to re-establish habits of industry, of discipline and of accomplishment. Recreation is given to relieve his distress, to stimulate his interest and to place him in a better emotional condition.

In some institutions group therapy in such forms as "sing-songs" and reading groups is provided. People will apparently do things in a crowd, as its members all move together, that they would not do were they alone. Such acts are often stepping stones along the path leading to individual achievements.

Group discussions or "pep talks" by members of the staff are provided for favourably progressing patients to encourage them and to explain in a common sense manner the causes of mental illness and simple principles to follow in overcoming them. The purpose of hospitalization, the necessity of periodically taking stock of their assets, and the value of insight into their condition are presented. To those patients who are coming along well, helpful pointers are given explaining the purpose of boarding-out in private homes and of mental health clinics, how they are to maintain their mental stability when they return to society by such methods as joining clubs and by avoiding the tendency to tackle too great a task. Such helpful bits of advice from those particularly qualified by experience and training to give it, are listened to eagerly, and their value certainly more than justifies their presentation.

Shock Therapy

If one may judge from the unending flow of literature on this subject, it appears that, while many writers insist that their results from shock treatments are no better than their former results with psychotherapeutic technique, there are still sufficient number of them that do report their patients are offered a great chance to improve by the use of hypoglycemic shock and metrazol shock treatment, to warrant their continued use at least until some obvious disadvantages are shown or until some more favourable therapy replaces it.

A brief account of the technique and principles involved may serve to enlighten those who are unfamiliar with the subject.

In general terms, the therapeutic technics vary with the individual and thus the doses, intensity and duration of treatment are all variable factors. It is only by clinical experience that we can decide and vary the methods of application.

(a) Metrazol—This technique is that outlined by Meduna. Convulsive doses of metrazol cardiazol (pentamethylenetetrazol) intravenously of 10% aqueous solution twice a week are administered. Usually an immediate epileptiform convulsion ensues lasting about 60 seconds. The initial dose is 5 c.c. and subsequent doses are increased 1 c.c. Recently Meduna described a slight modification. If no convulsion results with a given dose, a second injection of 1 c.c. more than the first is administered one or two minutes later. If no convulsion is present then, the procedure is repeated on the following morning with the same dose as on the previous day. Barbiturates or other sedatives are given only if repeated seizures occur. Treatments are given in the morning to a fasting patient. Care is taken to avoid laceration of the tongue and lip, or subluxation of the tempormandibular joint during seizure. Meduna advises a minimum of 25 grand mal convulsions to be tried before giving it up as a failure. In favourable cases three or four convulsions have caused remissions.

It is the metrazol treatment which, it would seem, will finally replace the other types owing to its convenient administration, and results seemingly on a par with any of the other forms of shock therapy.

(b) Camphor Metrazol Therapy—According to Friedman's modification. The patient is placed on a special alkalising and hydrating routine for two to four weeks time, and then metrazol injections are given, but the injections are on alternate days with alkalization and hydration cotinued throughout the treatment. The result obtained is a deliriform, confused state punctuated by convulsions which result often in subordination of the dominant psychotic pattern and eventually in a "social" remission or perhaps a total recovery.

(c) Insulin Hypoglycemic Shock Therapy—according to Sakel. The present technique consists of determining the individual coma producing dose by administering insulin subcutaneously daily three times a week to the fasting patient starting with 5-15 units and increasing 5-15 units each treatment until the patient goes into "insulin shock" or "coma." Up to 30-60 treatments may be given in continuous series without danger. Each treatment lasts 4-6 hours or more and is terminated artificially by the intranasal lavage of sufficient sugar solution or by the intravenous injection of dextrose in amounts sufficient to neutralize the insulin dose.

(d) The combined Insulin-Metrazol Procedure—according to Angyal, Muller and Gyarfas. Many workers have given convulsive doses of metrazol to patients in the first, second or third hour of hypoglycemia after the patients had failed to respond to insulin alone. It seems, however, that since neither insulin nor metrazol have been conclusively studied the combination is premature if not even dangerous.

By the use of shock treatment the physiological changes that occur are chiefly stimulation and irritation of parts of the central nervous system, mainly the medullary centres and basal ganglia, thence through various cortical areas in an irregular fashion. By the diencephalic medullary irration, there is a diffuse automonic nervous system irritation and so profound transitory changes in cardiovascular, respiratory and metabolic functions.

More important, though, are the great changes in mental reactivity and social behaviour that often transpire in a dramatic manner. With the metrazol induced convulsion, for example, the patient, within a single day or within several hours, may undergo a profound

upheaval of personality. A previously dominant psychotic reaction is subordinated and the patient's behaviour becomes that of a controlled social being with reactions correctly oriented to the outside world of reality. Although these changes are often shown to be transitory, they are nevertheless significant.

To explain the rationale of shock therapy, many widely varied hypotheses have been formulated. That advanced by Friedman seems as reasonable as most. In his own words, "These pharmaco irritative procedures tend to propel the patient's personality back in the direction of a primitive relatively undifferentiated biologic state, perhaps remotely analogous to what must exist in a new born or pre-born child. In so doing there is provided a powerful and highly accentuated impetus to the movement of opposite forces towards redifferentiation of the personality. This process of redifferentiation may carry with it a stronger tendency back towards the normal than towards the pathologic. It may be that some such artificially propelled disturbance of equilibrium and some such interplay of the antithetic forces as this acounts for the restoration of some patients to a socially recovered state, with manifestly normal personality organization."

Hydrotherapy

This type of treatment is used largely in excited patients more often in the affective disorders than in schizophrenia.

(a) Continuous Baths—the tub used for this purpose is larger than the ordinary type and is so fitted that there is a constant inflow and outflow of water kept at a uniform temperature. It utilizes the sustained influence of moderately increased warmth so that the induced skin hyperemia decreases the blood volume in the central nervous system. This results in a physical relaxation and then in a feeling of fatigue that leads to sleep.

The temperature is kept at about 97.5 degrees F. and the patient lies elevated on a canvas sheet. A canvas cover over the tub prevents exposure. The patients are placed in baths for durations of time varying from one hour daily to twenty-four hours continually. While patients are in these baths, they are kept constantly under observation by nurses especially assigned to the treatment room.

(b) The Cold Wet Pack.—This is a means of therapy in which the patient is wrapped in cold wet sheets for varying lengths of time. It has a greater therapeutic influence than the continuous bath, due to the "hydrotherapeutic shock" occurring when the cold sheets are first applied. It causes first a cutaneous capillary contraction and then a marked dilatation, leading to a flooding of the body surface with blood and so a pleasurable sensation of warmth. The circulation is greatly stimulated by such treatment. With these packs, the psychotherapeutic approach must, of course, be appropriate, and it stands to reason therefore that they are never used as restraints or administered in accompaniment of threats.

(c) Warm Wet Packs.—These are not of much value, as they lack the shock effect.

(d) Dry Packs.—These are mere restraints and often indicated to prevent exhaustion during the process of tube feeding, the restraints being removed at once after the feeding.

Hospital Care.

The nursing profession realizes that one of the most difficult positions in their field is that of nursing an actively psychotic patient. All the functions of personal hygiene require careful attention. Such duties as washing of the eyes to avoid ulcer formation and the massage of the limbs to prevent contractures, are among the many requirements of the comatose patient. The encouragement and teaching of

self-feeding, and where that should fail, skilled spoon-feeding, and finally tube feeding where indicated are the elements of a daily routine of a mental hospital nurse.

In the hospital environment, the creation of new contacts and new opportunities continually, even for the most deteriorated chronic case, is most significant. The natural simplification of life allows those to excel who have found competition too keen in the complex struggle outside. This restores confidence and helps much as another step in allowing them to lift their heads once more. The peace, quiet, order, discipline and kindly understanding on the part of the staff are all conducive to the natural tendency that is present in all patients to recovery.

The hospital provides security from those outside factors and influences which may have been pre-disposing causes of the patient's mental breakdown. Thus the mere removal of the patient from the detrimental influences of an unsuitable home or other environment is in itself an important factor in producing earlier recovery.

Another aspect often forgotten by relatives once they have the very disturbed patient under hospital care, is the suicidal tendency that is present in many patients, particularly those who are hallucinated or unduly depressed. This problem of protection of the patient from himself requires special vigilance on the part of the attendants and nurses, is most difficult, and yet is handled with perfect success in most mental institutions.

The patient while under hospital care is not required to make any very significant decisions. It is true that each action of the day in the life of every person is preceded by the necessity to make a decision. And in the case of the mentally ill, considerable tension is often created in deciding even simple problems. By following a planned routine, the patient is told what to do and so he avoids the mental strain otherwise created.

Physical Care, Medical Care, Dental and Surgical Treatment.

With the ratio of patients to psychiatrists as high as it is, with psychiatrists as usually the only physicians, and with all of the above-mentioned duties kept in mind, one might wonder how physically ill patients are cared for. Yet it is also the duty, and faithfully performed, of these same physicians with the aid of the nursing staff, to keep close check on such matters as proper nourishment, control of excretory functions, provision for proper rest by use of baths or drugs, preventative measures like vaccinations, and all the varied aspects of general medicine which confront them. In the latter class is included the necessity for extensive treatment for neurological syphilis, endocrinologic therapy as indicated, care of alcoholics and those with drug addiction, and so on. Fortunately for the physicians, trained dentists are always present to take care of teeth disorders.

Summary.

Modern mental hospitals no longer consider the custodial function as its one great obligation to its patients. Individualized analysis, psychotherapy, specialized group and individual occupational therapy, hydrotherapy, quiet, kindly discipline and attention to physical disorders are among the many varied items that round out the treatment for the mentally ill.

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Feature Section

J. C. McCULLOCH, EDITOR

FIRST AID ON THE HIGHWAYS

By WILLIAM BUTT, '40

Superintendent, Ontario Highway First Aid Stations, First Aid Instructor, St. John Ambulance Association.

The steady increase in the highway accident toll in this province, until it has reached alarming figures, is only too well known by everyone. The fact which is of the greatest concern at the present moment is that the majority of the traffic collision cases arrive at the hospital without any previous First Aid care whatsoever. A large number of fatalities, to say nothing of crippling injuries, occur each year, not as direct results of accidents, but from the careless and injurious handling of the victims by well-meaning persons who try to get the injured ones to the nearest hospitals or doctors as quickly as possible. Unfortunate motorists with fractured spines are wildly jerked from wrecks and ditches and bundled into the back seats of passing autos; others with their life-blood gushing from their arteries are also victims of these mad rushes to medical aid. Those few precious moments during which a life could be saved by the application of simple common-sense measures, are let fleet away.

The poor handling of a patient on the highway cannot be overcome by the skill and technique of the surgeon in the operating room. Irreparable damage can be done by attempting to lift an unsplinted fracture patient even to carry him a few feet. Here there may be damage to blood vessels, nerves, and muscles, added to the already serious bone injury. The "jack-knifing" of a patient through a car door, in an overzealous attempt to rush him to the hospital, will readily result in a simple fracture becoming compound or complicated, with all the serious possibilities that may be indicated.

It has been definitely proven that the first fifteen minutes after an accident constitute the danger period during which those perplexing and crippling complications occur in extremity fractures. Traumatic shock is one of the pressing problems of all traffic accident cases, and since the greatest single cause of this condition in fracture cases is motion at the site of the break during transportation, it is of the utmost importance that all extremity fractures be splinted where they lie at the scene of the accident.

Uncontrolled arterial haemorrhage is the causative factor in many highway fatalities. The severe haemorrhages can readily result from lacerations caused by broken glass and sharp pieces of jagged metal. The placing of a patient in the proper position and the application of firm digital pressure on a clean handkerchief placed directly over the wound (except in the case of a fracture), or the placing of a simple tourniquet around a limb is all that is required to stop the majority of the external haemorrhages encountered. Many victims bleed to death each year on the way to the hospital, because these simple measures were not applied.

Highway First Aid Stations

Organized First Aid work on the highway of this province was begun in 1934 with the establishment of a system of Highway First Aid Stations along King's Highway No. 2, from

Toronto to the Quebec Border. At the present time there are 43 Stations in all, situated on all the main high of the provinces and operated under the joint auspices of the Ontario Branch of the St. John Ambulance Association, the Ontario Division of the Canadian Red Cross Society, and the Ontario Motor League.

Since a large number of the highway accidents occur upon the stretches of road remote from medical care, these Stations are established in rural and suburban districts, near where accidents have most frequently occurred. In each case the existing facilities are used, that is to say, gasoline stations, tourist camps and general stores. One Station, nine miles east of Kingston, is situated in a roadside dance hall. The Stations are designated by a characteristic triangular sign bearing the words, "FIRST AID POST," and in the corners are the emblems of the three sponsoring organizations. Two signs are placed on the road-shoulders immediately in front of the Post and two at one mile distances, the two latter signs bearing the words, "First Aid Post One Mile."

The personnel of each First Aid Station or Post consists of a team of six or more selected men who have received the St. John Ambulance First Aid training. These men include garage mechanics, tourist camp employees barbers, storekeepers, farmers, and any reliable man connected with the place at which the Station has been established, or who lives in the immediate neighborhood Wherever possible, highway workmen are organized for the training. The Provincial Traffic Officers often attend the classes and are very co-operative in the work. First Aid supplies are carried in a small metal box on the back of their motor cycles.

The equipment of each Post consists of four signs, a heavy woolen blanket a stretcher, and a portable box containing splints, bandages and other dressings. These dressings are specially devised and wrapped in order that they may be applied in an aseptic manner by even the greasy hands of the garage mechanic. The equipment is kept in a conspicuous spot at the Station, and in the event of an accident, it is rushed to the scene with the garage service truck. A telephone is available at each depot and a list of the local doctors and ambulances is posted. No charges are made for the training or the equipment given to the Stations. No payment is received by the First Aid Volunteers for services rendered.

The men are trained in what-not-to-do as well as in what-to-do-till-the-doctor-comes. They know, which unfortunately the majority of the public do not, that it is often more advantageous to leave the accident victim in the position in which he is found, than to risk the possibility of puncturing internal organs and causing serious internal haemorrhage by roughly bundling him into the back seat of a passing auto to be rushed to a hospital. They are made fully aware of the fact that more victims are killed or permanently crippled than are saved by these improvised ambulances. Actual highway emergency conditions are duplicated as far as possible dur-

Ontario Highway First Aid Post at Deseronto, King's Highway No. 2.

The Highway First Aid Patrol Ambulance is shown in the background.

ing the training of these men. Sham accident scenes are produced with the wrecked car and "victims" supposedly inflicted with various injuries common to such accidents. Proper methods of handling and removing patients with fractures, and the stopping of severe haemorrhages, are demonstrated. The members of the class rush in and rescue the "victims" from the wreck and give their appropriate First Aid treatment. In this way the Volunteers receive practical training in the handling of patients amid the surroundings as they would find them at an actual acident on the highway. These demonstrations prove very popular with passing motorists and a large number of them stop and take an active part in the rescue work.

In the event of a collision on the highway in the vicinity of a Highway First Aid Post, the First-Aiders are notified by the Provincial Traffic Officer, or by a telephone call from a farmhouse near the site of the affair. The superintendent of the Post at once makes arrangements for a medical doctor and an ambulance to go to the scene of the collision. His trained helpers are summoned, and with the emergency equipment on his service truck he speeds to the aid of the unfortunate motorist. Upon arrival at the scene, the trained First Aid Men take complete charge of the emergency treatment prior to the arrival of expert medical aid. The extent of the injuries is quickly ascertained, and the appropriate First Aid treatment given. Upon the arrival of the doctor, these men immediately place themselves under his charge and await his orders. There is positively no clashing of duties between the trained Highway First Aid Men and the doctors.

Members of the medical profession in the highway towns and villages have closely co-operated with the work of the First Aid Stations and have aided in the training of a large number of the Volunteers. It is their common opinion that if equipment and trained First Aid Men were available at regular intervals along the stretches of highway in the country districts, their task of saving accident victims would be greatly lessened, and that the death toll from shock and haemorrhage would be tremendously lowered.

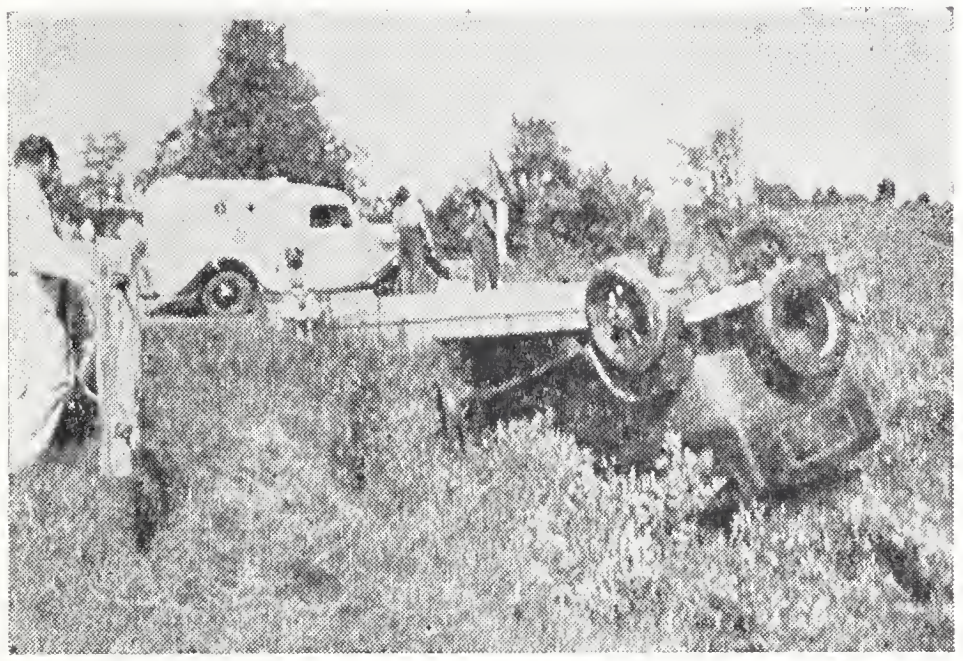
The activities of the Highway First Aid Stations are recorded on special fortnightly report forms. The various injuries treated are described, and the supplies used indicated. During the year 1937, a total of 140 injuries were treated, 20 per cent. of which were classified as serious. The saving of at least two lives and the prevention of permanent deformities in many other instances can be attributed to the prompt and efficient First Aid care given. The injuries treated show a great variety. Twenty-one cases of fracture, five of severe arterial haemorrhage, ninety lacerations, and a large number of burns, sprains and eye injuries are on the list of injuries treated.

On the evening of June 4th, 1937, a request was received at the Highway First Aid Station, on King's Highway No. 2, midway between Kingston and Gananoque, to render First Aid to the vicitims of a head-on collision between an automoboile and a large transport truck. The accident had occurred about two miles from the Station. The head man at the Post, after telephoning for a doctor and an ambulance, drove to the accident scene with the equipment and two of his trained staff. In the words of the Station chief in his report: "The extreme darkness made rescue work very difficult. The driver of the auto had been thrown out onto the road. Upon quick examination we found that he had received a complicated-compound fracture of the left tibia. A large piece of bone had been gouged out and the ends of the main shaft were protruding through the skin. This was further complicated by severe arterial haemorrhage immediately below the knee. This victim also had a three-inch gash on his scalp near the forehead which bled profusely. The transport driver had a simple fracture of the left forearm and deep gashes in the face around the right eye. Much

blood was being lost from these facial injuries. The auto driver was obviously in the greater danger and received immediate attention. The arterial haemorrhage was stopped by applying a tourniquet on the femoral artery in the thigh. Large pads of sterile gauze were placed over the wound after the tissue around and the wound itself had been painted with iodine solution. No attempt was made to apply extension to the limb. A long board was torn off a nearby gate and used as a splint. Pieces of upholstery from the wrecked car were used as padding between the limb and the splint, and movement was prevented by the application of a number of triangular bandages. Every precaution was taken to prevent further injury through unnecessary movement. The scalp wounds were treated with iodine and firmly bound to stop bleeding. The injured forearm of the transport truck driver was carefully splinted and his facial wounds dressed. The patients were sent to the Kingston General Hospital in an ambulance." The prompt administration of First Aid in this case was responsible for saving the life of this victim of the highway carnage.

Mobile First Aid Units

In addition to the fixed Highway First Aid Stations in the province, there are a number of Mobile Highway First Aid Units which are constantly on the roads and at the service of the motoring public. The telephone and electrical companies with their crews and work trucks are up and down the stretches of highway throughout the province while engaged in their various line duties. These men are all well trained in the realm of First Aid and carry complete First Aid kits. Many other concerns operating large fleets of transport trucks or service trucks on the highways also have their drivers trained, and provide them with the necessary equipment. These Mobile Units have been very active in the rendering of prompt and skilled First Aid at the scenes of many serious highway traffic collisions. By having these fleets of trained men with supplies moving from place to place along the highways, the probabilities of the emergency services being at the scenes of accidents promptly are greatly increased.



The Ontario Highway First Aid and Patrol Ambulance on duty on King's Highway No. 11, near Orillia.

Highway First Aid Patrol Ambulance

In the spring of 1937 a new, fully equipped First Aid Ambulance was put into service as a demonstration car and as a patrol on the heavily travelled highways. This "mobile-hospital" is fitted with electric lights and a ventilating system. Hot and cold water are always available and complete First Aid supplies are carried in neat cabinets along the walls. Two stretcher cases and four "walking wounded" can be accommodated. This Patrol Car was utilized during the past summer for demonstration purposes and in a systematic patrol of the highways during the heavy traffic holiday periods of Dominion Day, July 4th, and Labor Day. A total of nearly 12,000 miles were travelled during the period May 29 to November 4, 1937. During this

time the Patrol Ambulance was in attendance at more than 20 collisions.

On the morning of July 19th, while the First Aid Ambulance was on patrol duty on King's Highway No. 20, an automobile accident was encountered at the western entrance to Niagara Falls.

Niagara Falls, Ontario, July 19, 1937, a life is saved by Highway First Aid.

A young lad was found lying on the ground beside his overturned car. He was bleeding profusely from a deep gash in the right temporal region of the scalp. A large piece of skin had also been torn from the left elbow and there was an extensive bruise on the thigh of the same side. First Aid treatment was rendered at once, pressure was applied to the severed temporal artery and the other injuries bandaged. Within a few minutes after the accident, the lad was on his way to the hospital in the Patrol Ambulance, his haemorrhage stopped, and the effects of shock lessened by wrapping him in warm blankets. The emergency treatment given in this case was undoubtedly instrumental in saving the life of another unfortunate motorist.

World Wide Work

The International League of the Red Cross Society, with its headquarters in Paris, is making every effort to encourage the establishment of First Aid Stations on all the important automobile routes of the world. The pioneer work in Highway First Aid was begun in France in 1926 under the direction of the French touring clubs. Within the next few years the work was eagerly taken up by England, Hungary, and the Netherlands.

The fifteenth International Red Cross Conference, held in Tokyo in 1934, passed a resolution expressing the hope that each National Red Cross Society would give special attention to the development of effective and uniform facilities for rendering First Aid on highways, in close co-operation with national touring associations and automobile clubs. A conference was held in May, 1935, at Budapest, at which reports of the organization of First Aid on highways was made by representatives of the Red Cross Societies of a score of countries. The preparation of films to illustrate the proper First Aid care of highway accident victims and of the simple rules to be followed in the giving of such treatment were considered. Plans were also made for the standardization of Highway First Aid work over the world.

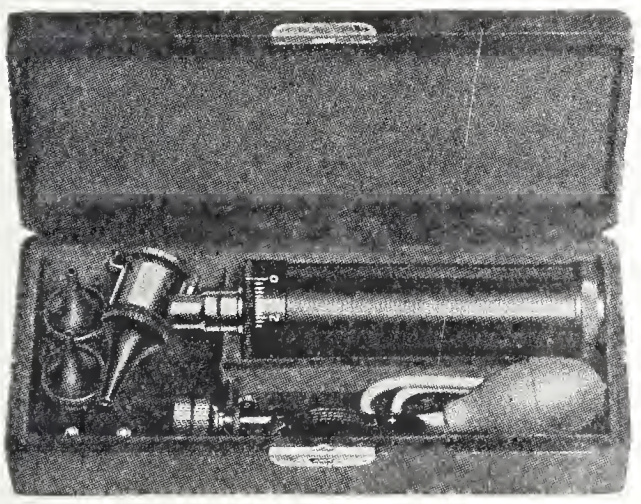
Highway First Aid work was practically new on this continent when begun on an extensive scale in Ontario in 1934. At the present time there are over 1,536 fixed Highway First Aid Stations and over 621 Mobile First Aid Units in operation in the United States. British Columbia and Nova Scotia have recently entered this field of highway work. Plans have been prepared for the establishment of a system of First Aid Stations along the principal automobile routes of India and New Zealand. At present there are over 10,000 High-

way First Aid Stations in operation throughout the world.

Conclusion

First Aid training of employees has worked marvels as a safety measure in the reduction of the appalling number of industrial accidents. The training of groups of men at the various Highway First Aid Stations, augmented by the large numbers of those receiving similar First Aid training from other sources will constantly increase the number of automobile drivers on our highways who are potential First Aid Men. These men are constantly reminded of their responsibility towards their fellowmen and as a result drive more carefully. The very presence of the First Aid signs on the highways has already had a great effect on many careless motorists from the psychological angle.

From the results already obtained from the large number of First Aid Stations now established throughout the world, it may be justly concluded that if every one of the main travelled routes of this province were provided with this emergency service, the annual number of deaths resulting from road accidents would be greatly reduced. From the large number of inquiries received at the Highway Stations, it is evident that the public are showing a sympathetic attitude towards the work that is being done, a factor which is of the greatest importance in the future success of the project. An extensive increase in the number of Highway First Aid Stations for Ontario has been planned for this year. The service will be extended to include a large section of the western and northern parts of the province. It is the ultimate aim to have every part of the Provincial Highway System, remote from the hospital conveniences, adequately equipped with First Aid Stations.



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With the summer's vacation in the far distant past and with more than a month of this school year already gone, it begins to look as if the only thing to do is to take a firm hold on a corner of that proverbial new leaf and give it a turn,—change our ways, and take up this medical course again in a really serious vein.

The Medical Society also begins its year of work to keep time with this general course of events. Just a word here for the benefit of the first year men, to say that the Medical Society is a strictly student organization made up of representatives from all the years, chosen by election in the spring of the year. The first duty of the Society each year, although a very pleasurable one, is to extend a hearty greeting for itself and for the men in all the years to the class of freshmen who have deigned to cast their lot for the next six years as students of that weird and wonderful—yet sometimes rather exacting course of Medicine.

Already the first year men have been duly introduced by the Annual Soph-Frosh Banquet at Hart House, which was under the capable and efficient handling of Bill Sedgwick and George Culnan and their respective executives in second and first years.

Next, the Soph-Frosh Dance — an event of November the fourth at the Royal York—is to take place. This promises to be a top-notch affair again this year, as Bob Shuttleworth's Orchestra has been secured to provide the music and already the tickets for it are being fast sold. It's the first real get-together where all the years may come—and by the looks of things, every year is sending a sizeable delegation.

The other main concern of the Medical Society at this time is the fate of the Canadian Association of Medical Students and Internes. This worthy organization under the guidance of Paul McGoey is launching its program this month, and if the students as a whole will rise in its support, it will achieve great things. Space is much too confined here to begin to outline the plans of this association, but it is the duty of every undergraduate to concern himself with the program and become familiar with the purposes for which it is striving.

This is just a brief summary of the events of immediate importance. There will be more to follow—but the main point that stands out in these and in every undertaking throughout the year is the amount of enthusiasm with which they are met by the students. Let's get behind these men and make this the biggest year yet!

Medical Athletics

M. P. TOWNSEND.
Secretary-Treasurer.

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First Year Rep.—R. D. Jolly.
Quartermaster—T. Statten.

In continuing, this year, the plan of printing a short article in each issue of The Journal, dealing with Medical sports and sportsmen, we hope, in some small way to stimulate interest among those not actively participating and to encourage those defending the honour of the faculty in the field of sport. It must be realized that this article cannot act as an intermediary for current events because of the long period between issues. Therefore we must deal with more general topics.

For the benefit of those not conversant with the composition and duties of the Medical Athletic Association, we felt that a short description might be of interest, particularly to the Freshmen, to whom we look for material to carry on the Medical teams of the future. The Athletic Association consists of six men, one from each of the six years and elected by the student body at the annual elections. The three senior offices are held by men from the three senior years. However, each member has a vote on questions arising at the regular meetings of the Association. It is the duty of these men to organize medical activities in interfaculty competition, to appoint managers, procure coaches and authorize the expenditures of the appointed Quartermaster for the purchase of equipment. Since the money spent by the Association is a portion of your Medical fee, all should take an interest in the election of these men.

The Association awards an Athletic letter to each man applying after having fulfilled one of the following requirements:

I. Three years' participation in interfaculty sports.

II. Membership on an interfaculty championship team.

III. A first "T" holder.

At the time of writing, three of our teams have "encountered the enemy" and in two cases "they are ours." Senior "Meds" Volley ball team, to quote the Varsity, "showed mid-season form" in defeating U.C., while Senior Meds. football team, under the able coaching of Selkirk of the Argos, showed championship form in defeating Senior S.P.S. by a "box-car number" score. However, Junior Meds. suffered a defeat when they failed to out-mud Trinity in a driving rain. Conditions were far from favourable and the scoring was surprisingly low for a slippery ball. The Juniors assure us that the score will be reversed next game.

Soccer, Lacrosse and Waterpolo are all under way and strong squads are out in each. The Waterpolo teams hope to strike their winning stride of two years ago, when an all Meds final resulted. The Soccer squad hopes to do even better than last year, when they were put out by Vic. in the finals by a 1-0 score.

Due to the increased turnout in Volleyball this year, it was found necessary to form a third team to find positions for all of the talent. It is hoped that the Volleyball teams may be as successful as last year's basketball teams, when the three Meds entrants reached the five-team "round-robin" final and the Intermediate team defeated the Seniors.

The number of Medical men on the Senior football squad has reached a low ebb and despite the stellar playing of Cam Gray and Jack Holden, the loss of Turney Williams and Colin Brebner is sorely felt. Cam is still Varsity's scoring threat and is still Canada's best placement kicker and it is unfortunate that this year's team has not been able to bring the ball oftener within the range of Cam's educated toe. Cam

graduates this year and will carry into the Medical profession a personality that has made him a friend of all who knew him. Jack Holden, like his teammate, also graduates this spring, and with his going the "old man" of Varsity football passes. Jack has held, for the last two years, the distinction of having played more years than any other player on the Varsity squad. His position at outside wing has been a difficult spot for the opposing team since most of us can remember and his ability to snare passes from seemingly impossible positions is well known.

Lesser satellites, yet striving to their utmost, are Medical men on the Intermediate and Junior football squads, the Waterpolo, English Rugger, Soccer and Tennis squads and we hope we may have room to give them recognition in a later issue.

In closing we would like to urge all of the men in Medicine, capable of helping, to make this a Medical year in Interfaculty competition. At the same time you will benefit beyond measure, for the self-control and friendship gained on the sports field cannot be equalled elsewhere, and the pleasure derived from a healthy body and mind resulting from sports should be best realized by you as medical students. So let's all play something this year, be it Senior football or Interfaculty, and remember that if your only sport is ping pong, you too can defend the honour of the Faculty in Interfaculty competition.

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Abstracts

HAROLD COPP, Editor.

GOITRE FROM THE STANDPOINT OF THE GENERAL PRACTITIONER.

By E. M. EBERTS—*C.M.A.J., Vol.* 39, *No.* 4, *October*, 1938, *p.* 324.

The purpose of this article is to resolve the problems of the general practitioner in the treatment of goitre and is based on 4,000 cases at the Montreal General Hospital.

Goitre is classified as three offshoots from the normal gland. The first is the endemic goitre, developing between ages of 12 and 17. If this persists into adult life perilobular fibrosis supervenes, resulting in nodulation. Occasionally thyrotoxicosis develops in this type of gland in middle life, and this entity is called secondary Graves' disease. The second offshoot is the type in which a solitary nodule develops. It is apt to become toxic between 40 and 60 and is the type in which carcinoma is most likely to appear. The third offshoot is the hyperplastic exophthalmic or Graves' type. Malignant goitre may arise in perilobular fibrotic, adenomatous, Graves' type or from the normal gland.

Endemic Goitre.

The primary cause in this country is the deficiency of iodine intake. Other factors are dietary defects, inadequate hours of rest, and focal infections. Treatment is prophylactic. Adolescents are given Lugol's solution, one drop a day in alternate months. Where goitre has already developed treatment is the same, operation being only justified for gross disfigurement, tracheal compression, thyrotoxicosis or malignant change.

Adenoma.

Adenoma must be removed because 25% will become toxic, the growth may occlude trachea, at any time haemorrhage may occur into it and produce sudden death, and fourthly it may become malignant. Operative mortality is 0.2% in simple and only 1.2% in toxic adenoma.

Graves' Disease.

In the treatment of this condition iodine and rest are essential. Lugol's solution is given 5 minims t.i.d. reducing the dose to 2 minims t.i.d. when control is established. Luminal in 1½ grain doses and cold spongings, morning and night aid in procuring rest. Subtotal thyreoidectomy is done when there is no marked stare, oedema of lids, or continued loss of weight, with a B.M.R. of less than plus 50 and pulse below 100.

This article is an excellent summary of goitre and should be read in whole rather than in abstract. J.C.R.

HEAD INJURIES.

By WILLIAM OLIVER STEVENSON—*C.M.A.J., Vol.* 39, *No.* 4, *October*. 1938, *p.* 338.

It is generally recognized that there are three clinical states in head injuries: (1) concussion; (2) contusion-laceration, and (3) compression. In each of these are seen three stages: (a) the stage of shock, (b) reaction, and (c) convalescence.

(1) Concussion.

(a) Shock.—This is simple surgical shock, with rapid pulse, pale skin, shallow respiration, subnormal temperature, and low blood pressure. It should only last about 15 minutes and if prolonged, is serious.

(b) Reaction.—The temperature rises rapidly to 100.5 and then levels off. The pupil reflex returns followed by the vomit reflex, as the temperature slowly falls to normal. The patient regains consciousness, complaining of headache, dizziness and general malaise.

(c) Convalescence.—Temperature becomes subnormal, gradually returning to normal by the third week.

(2) Contusion-laceration.

The stage of shock is the same as noted above. In the stage of reaction, while the temperature levels off at about 100.5 instead of falling slowly to normal it becomes very irregular above and below the normal line. Reflexes return at about the same time. Signs of irritability are noted —day drowsiness, night delirium, restlessness, photophobia and headache. Convalescence lasts 6-8 weeks.

(3) Compression.

This may be acute, due to rupture of cerebral arteries or chronic due to spreading oedema and oozing of blood. In either of these shock occurs as before. In the acute the temperature rises above 100.5 without levelling off and may reach 104. The pupil on the side of the lesion is at first pin-point and later becomes dilated and fixed. Pulse is slow and the blood pressure is progressively higher. In the chronic the picture is similar except that

the temperature levels off at some point below 100.5.

Treatment consists of watchful waiting in the first two states. Temperature, pulse, respiration, and blood pressure are taken every ½ hour until the stage of reaction, then q.2.h. until conscious. Rest, mild sedation if irritable, attention to bladder and rectum, and fluids by rectum until conscious are the main points.

For acute haemorrhage operation is essential, while for the chronic a spinal puncture is done. If spinal pressure is above normal fluid is removed to reduce this pressure by half its reading. Also 75-100 c.c. of 50% glucose may be given intravenously to reduce cerebral oedema. Cranial fractures and lacerations are treated accordingly. J.C.R.

SCOLIOSIS

By Samuel Kleinberg, M.D., F.A.C.S., *New York, New York. Jour. Surg., Obs. and Gyn., October*, 1938.

In this article the author reviews the salient features of scoliosis.

Definition

Scoliosis is a rotary lateral curvature of the spine combined with deformity of the trunk. There are also visceral changes, which should not be forgotten.

Types.

These are two, functional and structural.

1. Functional Scoliosis is a temporary physiological distortion with lateral deviation of the spine. This may be corrected by voluntary effort. There are no skeletal or visceral changes. This type is common in the age group of 10 to 20 years.

Treatment consists in removing causative factors, as heavy clothing, obesity, auditory and visual defects, and in teaching a correct attitude. Corrective exercises may also be used. Treatment takes 1 to 2 years.

2. Structural Scoliosis indicates a fixed deformity of the trunk which the patient cannot voluntarily correct. Structural changes are present. The most apparent changes, which are in the spine, are used in describing the disease. In a description four terms are needed:

(a) Degree—mild, moderate, severe.
(b) Section of the spinal column involved.
(c) Direction of the convexity.
(d) Known or likely aetiology.

As an example—"Severe idiopathic right dorsal scoliosis." The author describes this deformity in detail, noting particularly that the convexity in the dorsal region is to the right, the vertebra in this region face more to the right so the right side of the chest is displaced posteriorly, there are compensatory curves above and below the dorsal curve and the height of the spinal column is decreased. Similarly Left Lumbar, Right Dorsolumbar and a compound Right Dorsal Left Lumbar Scoliosis are described.

Aetiology.

There are two types of structural scoliosis, congenital and acquired.

1. Congenital—which includes those that have not a manifest osseous defect.

(a) *Manifest Osseous Defect*:
(i) An extra centrum of a vertebra is present as a wedge.
(ii) There is a wedge formation of a vertebra.
(iii) Fusion of part of a vertebra with another forming a wedge.
(iv) Accompanying spina bifida occulta.

(b) *Without Manifest Osseous Defect*:
This type usually appears in early childhood or infancy and is due to contraction of the soft parts.

2. Acquired: which include those with and without known causes.

(a) *With Known Causes*: 30% of cases.
(i) Rickets. This type is severe and resistant to treatment.
(ii) Infantile Paralysis.
(iii) Lesions of the Chest, such as in empyema where an attitude is assumed to relieve discomfort and in thoracoplasty where there is a loss of bony chest wall.
(iv) Inequalities of the lower limbs.
(v) Other causes as defective vision, torticollis, neurological disturbances, severe hypertrophy of the heart, and hereditary scoliosis.

(b) *Idiopathic*: 70% of cases

Prophylaxis.

Children from 7 to 10 years of age should be observed for the commencement of scoliosis. Aggravating factors as obesity, posture and seating should be watched. A child should have adequate rest after long illnesses. Hereditary defects and weaknesses due to poliomyelitis should allow anticipation of the deformity.

Treatment.

1. *Mild Idiopathic Scoliosis*:
Corrective exercises can be sufficient.

2. *Moderate Idiopathic Scoliosis*:
This should be treated by reduction of the deformity and maintenance of the corrected position. Reduction may be obtained by:
(i) A corrective Plaster of Paris jacket, taking 6 months.
(ii) Traction on a convex frame, taking 8 weeks.
After correction the case may be followed by the use of celluloid corsets and corrective gymnastics for 2 years.

3. *Severe Idiopathic Scoliosis*:
   If the deformity is stationary the author advocates no interference. If the deformity is increasing, correction should be obtained by Plaster of Paris jackets, or by traction, followed by spinal fusion.
4. *Paralytic Scoliosis*:
   These cases should be treated early and the spine supported. In every case it is advisable to fuse the spine.

Scoliosis in infants may be treated by traction on a convex frame or by keeping the infant in a corrective Plaster of Paris bed. Cases should be followed till puberty.

Operative Procedures.

1. *Spinal Fusion*:
   The author uses the Hibb's technique. This operation can be used with all types of scoliosis but progressive and paralytic types and scoliosis with backache are special indications.
2. *Rib Resection*:
   Is used to decrease the asymmetry of the chest. J. C. McC.

SALIVARY GLAND TUMORS.

By Neil W. Swinton, M.D., F.A.C.S., *and* Shields Warren, M.D., *Boston. Massa-.chusetts. Jour. Surg. Obs. and Gyn., Oct.*, 1938.

These authors report 81 cases of salivary gland tumors operated upon at the Lahey Clinic.

Histogenesis.

Four theories are offered as to the origin of these tumors.

1. They may be adenomas with varying types of stroma. On the other hand recognizable adenomas are rare in the salivary glands, while this type of stroma is unknown in adenomas.
2. They may be mixed cell tumors from embryonic tissue combined with infiltration of the stroma with mucinous material. Mixed cell tumors are noted to occur in the region of the mouth.
3. They may be mixed tumors arising from tissue misplaced during the complex embryonic development of the face.
4. They may be derived from branchial clefts.

The authors feel their series indicate an origin from embryonic misplaced cells. The epithelial cells in some cases are characteristic enough to appear as adenomatous while in others the cells appear only as of epithelial origin. The authors feel histological subdivision is futile. They consider that carcimona arises from epithelial predominant tumors, fibrosarcoma from mesenchymal rich tumors.

Analysis of Cases:

In this group of 81 cases two kinds of tumour were found, mixed and "other types."

(a) Mixed tumours were found in 51 cases. Of these, 78% were in the parotid gland, 22% in the submaxillary. 72% of them occurred in women. The average age was 44 years, with a range from under 30 to over 60. The average duration was 2-9 years. The size ranged from under 2 to over 6 cms. in diameter. Recurrences over a period of 1 to 9 years were 4.3%, which was less than in other series. The recurrences tended to become malignant, as shown by one case.

The complications are:
   (i) Persistent salivary fistula.
   (ii) Nerve paralysis. This is particularly common in cases of recurrence where a scar of a former operation is present.

(b) The *other types* of tumor all occurred in the parotid gland and include:
   (i) Papillary adenocystoma, which are regarded as potentially malignant.
   (ii) Cysts, which must be completely excised to prevent recurrence.
   (iii) Chronic inflammatory tumors, with diffuse lymphacytic infiltration. At operation a diffuse enlargement was found, with swelling of the regional lymph nodes. Quick section assured the diagnosis. No calculi were found in Stensen's Duct. Facial paralysis was common in this group. There were no recurrences.
   (iv) Malignant tumors. The criteria taken were: rapid growth, invasive properties, cellular anaplasia, or metaplasia.

It was found that mixed tumors metastasize as some one element. The average age of the patient was 59 years, the average duration of the tumor 3.7 years. Radical excision with subsequent radiation therapy was used. The facial nerve was sacrificed. It was noted that the diagnosis between chronic inflammatory changes and malignancy could only be obtained by quick section at operation. J.C.McC.

THE CONTRIBUTION OF RADIOLOGY TO THE CANCER PROBLEM.

By G. E. Richards. *C.P.H.J.. Vol. 29, No. 9, September*, 1938, *p.* 425.

This paper is a plea for the early diagnosis, proper medical advice and early treatment of cancer. McCarty of the Mayo Clinic recently pointed out that "Up to 1900 no one had ever seen or at least described an early cancer of the stomach." Now, by radiological methods it has become

possible to diagnose carcinoma of the stomach while it is still operable. The most recent work has laid emphasis on the detection of changes in the gastric mucosa of a precancerous as well as an early carcinomatous lesion. Similarly by X-ray examination the accuracy of diagnosis of cancer of lung, kidneys, colon, and spine has been revolutionized.

In treatment, radiological methods are becoming more and more effective, so that in England in 1936, 50% of cases were treated by radiological methods alone, 30% by surgery alone, and the rest by combinations of these. Radiological methods are especially effective for cancer of skin, lip and cervix uteri. In these types the percentage of five year cures for stage 1 lesions approximates 90%. As well as being used alone, radio-therapy used pre- and post-operatively, is a formidable weapon to reduce post-operative recurrences and remote metastases. In case these should develop, these probably are best treated by radiological methods alone. Complete relief of bone pain is obtained in approximately 80% of cases of bony metastases. While few permanent cures are obtained, the palliative benefits are so satisfying as to form an indication for radiotherapy in such cases.

J.C.R.

The School-Child's Breakfast

Many a child is scolded for dullness when he should be treated for undernourishment. In hundreds of homes a "continental" breakfast of a roll and coffee is the rule. If, day after day, a child breaks the night's fast of twelve hours on this scant fare, small wonder that he is listless, nervous, or stupid at school. A happy solution to the problem is Pablum, Mead's Cereal cooked and dried. Six times richer than fluid milk in calcium, ten times higher than spinach in iron, and abundant in vitamins B_1 and G, Pablum furnishes protective factors especially needed by the school-child. The ease with which Pablum can be prepared enlists the mother's co-operation in serving a nutritious breakfast. This palatable cereal requires no further cooking and can be prepared simply by adding milk or water of any desired temperature. Its nutritional value is attested in studies by Crim et al who found that tuberculous children receiving supplements of Pablum showed greater weight-gain, greater increase in hemoglobin, and higher serum-calcium values than a control group fed farina.

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Book Review

THE HORSE AND BUGGY DOCTOR.

By Arthur E. Hertzler, M.D.

This book is of particular interest to us because it is written by a successful doctor who, "in the last half of the seventh innings" is still an active and brilliant student of medicine. It is not strictly an autobiography, nor is it a history of the times, but a little of both. His racy style and dry wit make easy and enjoyable reading. Throughout the book one feels that the author is talking as in conversation rather than writing.

In the midst of the tremendous activity of his life, he has found time to write some thirty medical texts. His ten volume work on Surgical Pathology, two volumes devoted to the peritoneum, a Minor Surgery, and a recently revised text on Local Anaesthesia, are to be found in our medical and pathological libraries.

The book begins with a short account of the state of medical science in his youth. As a preliminary to undergraduate study, he spent a year "reading medicine" under the guidance of a preceptor. This was followed by three sessions of seven months at Northwestern. The teaching of fifty years ago was essentially practical. One anatomist seems to have reached a peak of reckless abandon worthy of honourable mention. His lecture on the sphenoid bone was, "Gentlemen, this is the sphenoid bone. Damn the sphenoid bone." He says that he "did not know much but that little, well." He knew how to relieve pain and where not to cut.

After graduation he spent four busy years in country practice in Kansas. The horse and buggy was the dignified mode of travel. Standard equipment included a Colt six-shooter. On long trips it was used to while away the time taking pot-shots at fence posts and jack rabbits, or, more seriously, to discourage barking dogs, who would jump at the horses' throats and rouse them violently from their sleepy four-mile an hour gait. This portion of the book is filled with amusing adventures. One is made to feel regret that the automobile has deprived us of the hope of duplicating these experiences.

The author spent two years in Berlin, where he studied anatomy and pathology. He worked in the laboratory of the esteemed Dr. Virchow and there began his experimental study of the peritoneum.

Now came the most exciting phase of his career, those years devoted to kitchen surgery. He often sat up all night in the smoker of a slow train, and operated the next morning under the worst possible conditions. Abdominal surgery on a kitchen table, with a poor light, an uncertain anaesthesia and without trained assistance, would be a nightmare to any but the most daring. The author came to the conclusion that "for the performance of an excellent operation two things only are necessary, to wit, a surgeon and a patient." His caustic comment on the ways of the modern young intern as a surgical assistant should be a word to the wise.

The building of a private hospital at Halstead, Kansas, next claimed his energies. The first building was a large house, the present structure is a modern 150-bed hospital. He has a great deal to say about the type of insanity which inspires one to such an effort.

The final chapters of the book are devoted to a discussion of the relationship of a doctor to his patient. He stresses the necessity of really knowing the psychological background, before assessing the importance of symptoms. His criticism of modern medical fads is given weight by the wealth of his experience.

On reading this book one forgets Dr. Hertzler's achievements and remembers him as a long-legged young doctor, stretched out across the seat of the buggy, his feet dangling over the side. He is fast asleep and his weary horse seems unwilling to awaken him by moving faster than a slow walk—a horse and buggy doctor.

D.L.C.

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